United States Department of Agriculture

Soil Conservation Service

In cooperation with Missouri Agricultural Experiment Station

Soil Survey of Pettis County, Missouri

How To Use This Soil Survey

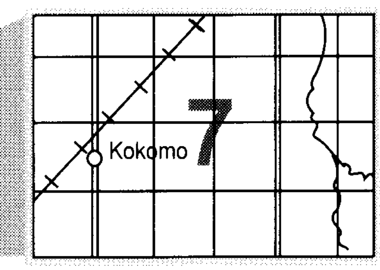
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

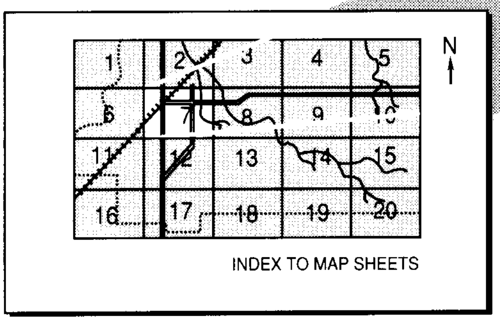
To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

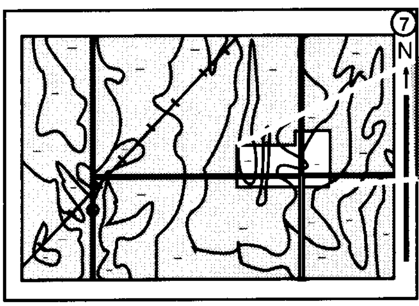
The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



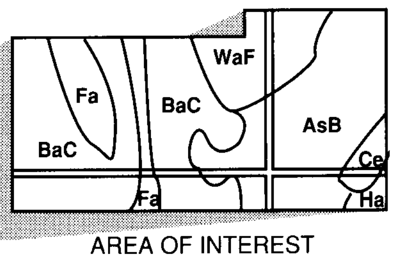
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1989. This survey was made cooperatively by the Soil Conservation Service and the Missouri Agricultural Experiment Station. Funding for district soil scientists was provided by the Missouri Department of Natural Resources and administered through the Pettis County Soil and Water Conservation District. The Pettis County Commission provided funds for office space. The survey is part of the technical assistance furnished to the Pettis County Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: A typical landscape in the Bluelick-Goss-Pembroke association. The pasture and corn in the foreground are on Pembroke silt loam, 5 to 9 percent slopes. The woodland in the background is on Goss very cobbly silt loam, 14 to 35 percent slopes.

Contents

Issued July 1995

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Pettis County, Missouri. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Russell C. Mills
State Conservationist
Soil Conservation Service

Soil Survey of
Pettis County, Missouri

By Keith O. Davis, Soil Conservation Service

Fieldwork by Keith O. Davis and Stuart F. Miller, Soil Conservation Service, and
John E. Bowers, Matthew L. Burcham, Timothy O. Knoernschild, and Curtis G. Marshall,
Pettis County Soil and Water Conservation District

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
the Missouri Agricultural Experiment Station

PETTIS COUNTY is in the west-central part of Missouri (fig. 1). It has an area of 439,360 acres, or about 687 square miles. Sedalia, the county seat, is about 85 miles east-southeast of Kansas City, Missouri, and 55 miles west-southwest of Columbia. In 1980, the population of the county was 36,378 and the population of Sedalia was 20,927 *(7)*. In 1990, the population of Sedalia was about 20,000 and the population of the county was about 35,000.

Farming is the main enterprise in Pettis County. The main crops are soybeans, corn, winter wheat, grain sorghum, and grasses and legumes. Beef cattle and hogs are the main livestock. Light industry and tourism also contribute significantly to the economy.

This soil survey updates an earlier survey of Pettis County published in 1914 *(5)*. It provides additional information and has larger maps, which show the soils in greater detail.

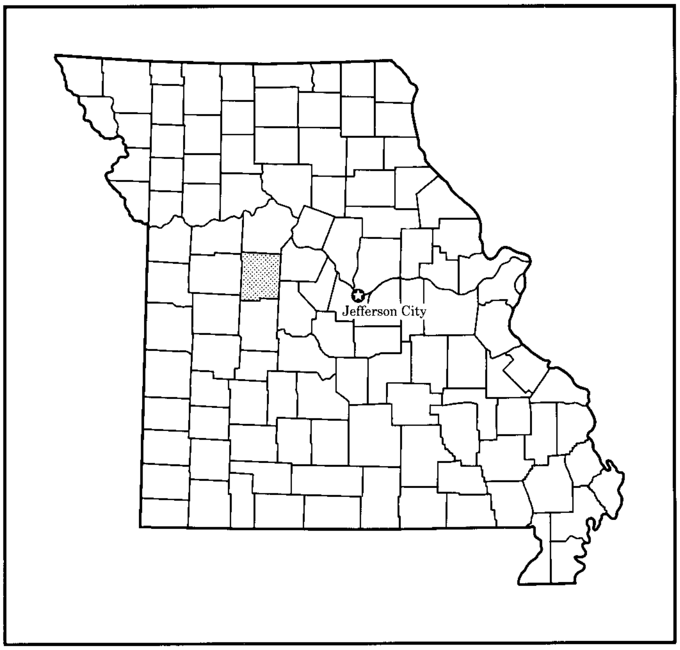


Figure 1.—Location of Pettis County in Missouri.

General Nature of the County

This section provides general information about the survey area. It describes climate; water supply; physiography, relief, and drainage; history and development; and farming.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Sedalia, Missouri, in the period 1951 to 1988. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 32 degrees F

and the average daily minimum temperature is 22 degrees. The lowest temperature on record, which occurred at Sedalia on February 9, 1979, is -27 degrees. In summer, the average temperature is 76 degrees and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 116 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 39 inches. Of this, 25 inches, or about 65 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 5.8 inches at Sedalia on April 16, 1960. Thunderstorms occur on about 53 days each year.

The average seasonal snowfall is 17 inches. The greatest snow depth at any one time during the period of record was 19 inches. On the average, 10 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 65 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 12 miles per hour, in spring.

Water Supply

Most of the upland soils in Pettis County are suitable for the construction of ponds and small reservoirs. Most livestock in the county get water from these sources. Household water can also come from ponds and reservoirs if they are properly located and the water is treated. For most of the county, ponds and reservoirs are the only dependable source of irrigation water. Flat Creek and Muddy Creek are the largest streams in the county. The flow rate is marginal in dry seasons and does not provide a dependable source of water for most uses. Municipalities in the county get water from deep wells. The city of Sedalia also gets water from Springfork Reservoir.

Physiography, Relief, and Drainage

The landscape patterns in Pettis County are diverse. Three major land resource areas, each with a distinct characteristic landscape, converge in the area. The northwestern part of the county has long, interconnected ridges with sloping hillsides dissected by small, branching flood plains. The southwestern part of the county has interconnected, nearly level ridgetops and very gently sloping side slopes that are extremely long. The northeastern part of the county is more dissected. Rocky, wooded hillsides dominate the lower side slopes. Stream drainageways are separated by side slopes and narrow, branching ridgetops. The southeastern part of the county is mainly grassland. Branching, interconnected ridgetops separate long side slopes. The soils in this area commonly have a dense layer in the subsoil.

History and Development

Stuart F. Miller, soil scientist, Soil Conservation Service, helped prepare this section.

Salt, an essential but scarce resource before the days of refrigeration, was what first drew European settlers to the survey area. Nimrod Jenkins, John Bowles, and Thomas Marlin and their families were the first permanent European settlers. They moved to the area in 1818. Like many early settlers in Missouri, they came from Tennessee and Kentucky. Also prominent in the early settlement were German immigrants, who preferred the wooded, rolling hills and river bottoms that reminded them of their former homeland.

Pettis County was named for Spencer Pettis, an early U.S. Congressman. The county was organized January 26, 1833. The first county seat was at St. Helena on Muddy Creek, known today as Pinhook. In 1837, Georgetown was designated the new seat of government. In 1852, George R. Smith tried to convince Georgetown residents to lure the planned Missouri-Pacific railroad northward to the county seat, but the town elders refused. As a member of the State legislature, however, Smith won a seat on the railroad's board of directors. He purchased 1,000 acres along the planned path of the railroad. The town that was established on this acreage was eventually named Sedalia *(14)*. The railroad had indeed made its way to town by the start of the Civil War, and Sedalia was home for an important Union garrison for the duration of the war.

After the Civil War, vast herds of cattle from the Texas plains were driven northward to Sedalia along the legendary trails of the Old West to be shipped "back east" by rail. Local cattlemen and farmers also shipped their goods by rail to the cities in the east. Pettis

County's importance to Missouri agriculture increased when the Missouri State Fair made its permanent home in Sedalia.

Sedalia is known as the birthplace of a uniquely American form of music called ragtime, which was made popular in the late 1800's by Sedalia resident Scott Joplin.

By the turn of the century, Sedalia was the social and economic center for the entire area. Agricultural development in Pettis County fueled much of this growth. A second railroad, the Missouri-Kansas-Texas line, or the "Katy," also passed through Sedalia. By the early 1900's, both the Missouri-Pacific and the Katy had moved their general shops to Sedalia.

Transportation, manufacturing, and agriculture are still the mainstays of Pettis County's economic base. Transportation continues to be important long after the decline of the railroads. Today, U.S. Highways 65 and 50 meet in the center of the county, providing secure access to national and world markets.

Farming

Agriculture has been significant to the life and economy of Pettis County ever since the days of early settlement. The number of farms decreased steadily after the initial settlement boom. In 1910, there were 2,869 farms, with an average size of 142 acres *(5)*. In 1987, there were 1,323 farms, with an average size of 281 acres *(13)*. About 56 percent of the farms are operated by part-time farmers.

In 1987, about 61 percent of Pettis County was cropland. About 36 percent of farm income was from crop production, and 64 percent was from livestock and related products *(13)*.

The general trend in farming in the last few decades has been toward fewer but larger farms and increased use of fertilizers, chemicals, and large machinery.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet

local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of additional soil data, variations in the intensity of mapping, and correlation decisions that reflect local conditions.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Dockery-Tanglenook-Lamine Association

Very deep, nearly level, poorly drained and somewhat poorly drained soils that formed in alluvium; on flood plains

The landscape of this association consists of flood plains along streams that dissect the county. It is marked by subtle changes in relief characterized by differences in elevation of only a few feet. Some areas have meandering stream channels or channel scars bordered by wet-site woodlands. Most areas range from one-half mile to three-fourths mile in width. The native vegetation was mixed prairie and hardwood forest.

This association makes up about 3 percent of the county. It is about 48 percent Dockery soils, 22 percent Tanglenook and similar soils, 18 percent Lamine soils, and 12 percent minor soils.

Dockery soils are somewhat poorly drained. They are on flood plains adjacent to stream channels. Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The underlying material to a depth of 60 inches or more is stratified, mottled, dark grayish brown, dark brown, and yellowish brown silt loam.

Tanglenook soils are poorly drained. They are on high stream flood plains a few feet higher than the adjacent bottom land. Typically, the surface layer is very dark gray, friable silt loam about 6 inches thick. The subsurface layer is very dark gray silty clay loam about 11 inches thick. It is friable in the upper part and firm in the lower part. The subsoil is firm silty clay about 39 inches thick. It is mottled. The upper part is very dark gray, the next part is dark grayish brown, and the lower part is grayish brown. The substratum to a depth of 60 inches or more is grayish brown, mottled, firm silty clay.

Lamine soils are somewhat poorly drained. They are on high stream flood plains a few feet higher than the adjacent bottom land. Typically, the surface layer is grayish brown, very friable silt loam about 6 inches thick. The subsurface layer is light brownish gray, friable silt loam about 4 inches thick. The subsoil is about 45 inches thick. The upper part is light brownish gray, mottled, firm silty clay loam. The next part is grayish brown and light brownish gray, mottled, firm silty clay. The lower part is gray, mottled, firm silty clay. The substratum to a depth of 60 inches or more is gray, mottled, firm silty clay.

Minor in this association are the somewhat poorly drained Nevin soils. These soils have a thicker dark surface soil than the Dockery and Lamine soils. They are on high stream flood plains.

About 80 percent of the acreage in this association is used for cultivated crops, primarily corn, soybeans, grain sorghum, and winter wheat. About 10 percent is pasture and hayland. About 10 percent is woodland and brushy areas adjacent to stream channels and peripheral drainageways. Flooding is the main hazard. Surface wetness caused by a seasonal high water table is a concern during extended wet periods.

The soils in this association are unsuitable for sanitary facilities and building site development because of flooding.

2. Pershing-Greenton-Dockery Association

Very deep and deep, nearly level to strongly sloping, somewhat poorly drained soils that formed in loess, limestone and shale residuum, and alluvium; on uplands and flood plains

The landscape of this association consists of branching ridgetops with sloping areas between them that form the beginnings of a dissected drainage pattern. At the lower elevations next to small streams, side slopes increase in gradient and incise into residuum derived from sandstone and shale. Where the smaller streams converge with large creeks, the adjacent upland areas are strongly sloping. The native vegetation was mixed prairie and hardwood forest.

This association makes up about 6 percent of the county. It is about 32 percent Pershing and similar soils, 22 percent Greenton and similar soils, 11 percent Dockery soils, and 35 percent minor soils.

Pershing soils are gently sloping and moderately sloping. They formed in loess. They are on ridgetops, side slopes, and foot slopes. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 46 inches thick. The upper part is yellowish brown, friable silty clay loam and dark yellowish brown, firm silty clay loam. The next part is grayish brown, mottled, firm silty clay and silty clay loam. The lower part is light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is gray, mottled, firm silty clay loam.

Greenton soils are moderately sloping and strongly sloping. They formed in a thin mantle of loess underlain by shale and limestone residuum. They are on side slopes. The surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 31 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam. The next part is grayish brown, mottled, firm silty clay loam. The lower part is brown and yellowish brown, mottled, firm silty clay. The substratum is yellowish brown, mottled, firm silty clay. Soft, platy shale is at a depth of about 48 inches.

Dockery soils are nearly level. They formed in alluvium. They are on flood plains. Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The underlying material to a depth of 60 inches or more is stratified, mottled, dark grayish brown, dark brown, and yellowish brown silt loam.

Minor in this association are the well drained, moderately deep Barco soils on the lower side slopes; the unstratified, alluvial Lamine soils on high stream flood plains; the poorly drained Otter soils on small flood plains; and the well drained Pembroke soils on ridgetops.

About 80 percent of the acreage in this association has been cleared. The cleared areas are used for row crops, such as corn, soybeans, and grain sorghum, or for pasture and hay. Some woodland is also in areas of this association, principally along streams or on uplands where dissected drainageways or a limited depth to bedrock make row crops or pasture less feasible. Most gently sloping and moderately sloping upland areas have deep or very deep soils that are suitable for row crops. Erosion is the major hazard in these areas. It affects both row crops and poorly managed pastures. Most of the bottom land also is suitable for row crops. Flooding is the main hazard in these areas. Surface wetness caused by a seasonal high water table is a concern in areas of all the major soils during extended wet periods.

Most of the soils in this association are suitable for sanitary facilities and building site development if proper design and installation procedures are used. Wetness and shrinking and swelling of the subsoil are the main limitations in areas of Greenton and Pershing soils. Dockery soils are unsuited to these uses because of flooding.

3. Hartwell Association

Very deep, nearly level and gently sloping, somewhat poorly drained soils that formed in loess; on uplands

The landscape of this association consists of long, branching ridgetops and extremely long side slopes that are very gently sloping. Foot slopes below the side slopes are adjacent to small flood plains that converge downward in the landscape toward larger streams (fig. 2). The native vegetation was prairie grasses.

This association makes up about 15 percent of the county. It is about 84 percent Hartwell soils and 16 percent minor soils.

Hartwell soils are on ridgetops, side slopes, and foot slopes. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsoil is firm silty clay about 39 inches thick. It is mottled. The upper part is very dark grayish brown and dark grayish brown, the next part is gray, and the lower part is grayish brown. The substratum to a depth of 60 inches or more is gray, mottled, firm silty clay loam.

Minor in this association are Greenton soils on the lower side slopes and the poorly drained Otter soils on flood plains. Greenton soils do not have a light-colored subsurface layer or an abrupt increase in clay content.

Nearly all of the acreage in this association has been cleared. Only hedgerows and some wooded draws remain. Most areas are used for cultivated crops. Some

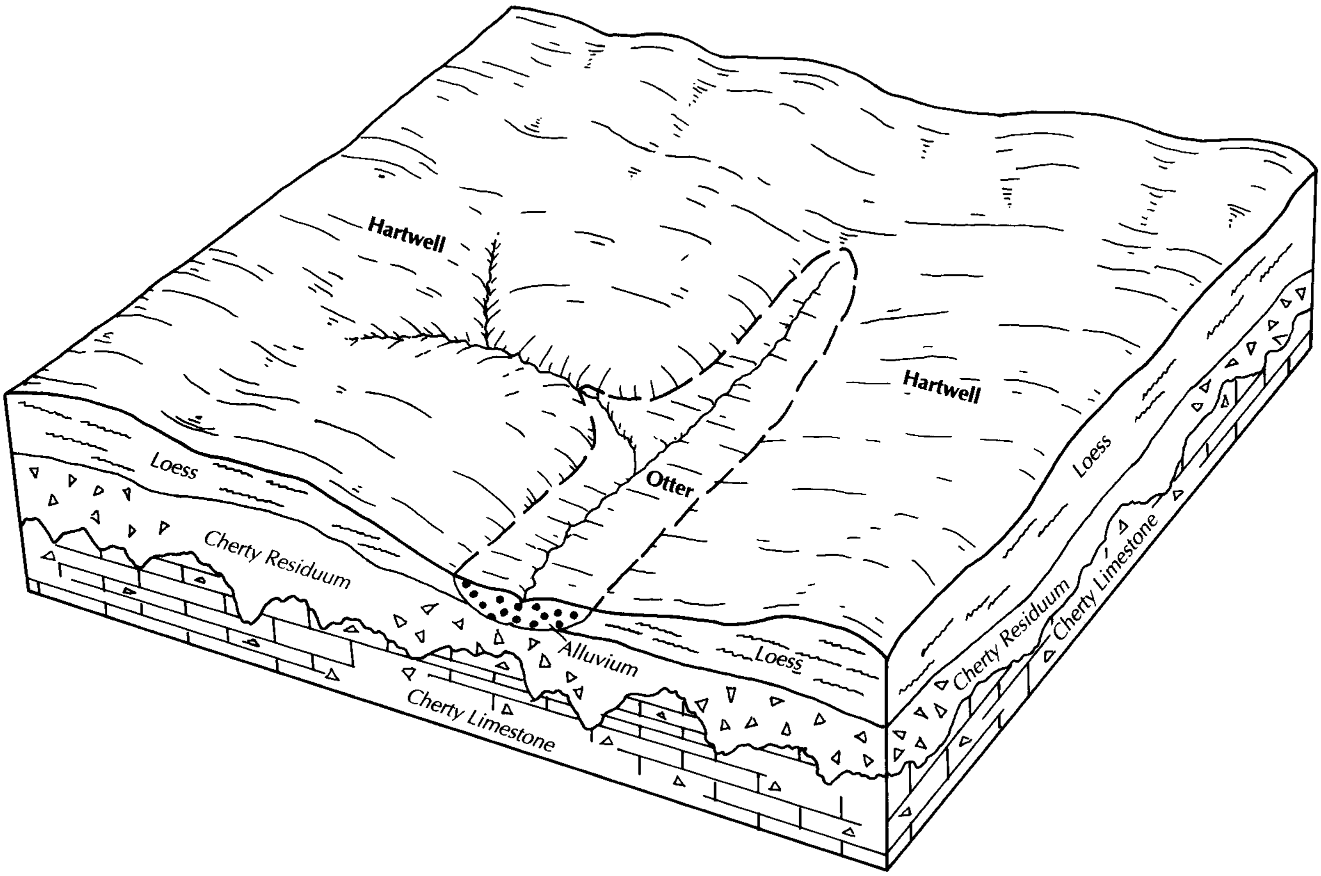


Figure 2.—Typical pattern of soils and parent material in the Hartwell association.

areas are used for hay or pasture. Erosion is the major hazard on side slopes and ridgetops. Surface wetness caused by a seasonal high water table is a concern in all areas of the association during extended wet periods.

The soils in this association are suitable for sanitary facilities and building site development if proper design and installation procedures are used. Wetness and shrinking and swelling of the subsoil are the main limitations.

4. Bluelick-Goss-Pembroke Association

Very deep, gently sloping to steep, well drained soils that formed in loess and cherty limestone or dolomite residuum; on uplands

The landscape of this association consists of long main ridgetops with numerous lateral side ridges. Sloping areas between the side ridges begin a branching pattern of drainage that converges to form small drainageways connecting with larger streams. Strongly sloping to steep areas with prominent drainage patterns border these bottom-land areas (fig. 3). The native vegetation was hardwoods.

This association makes up about 19 percent of the county. It is about 25 percent Bluelick soils, 22 percent Goss and similar soils, 20 percent Pembroke soils, and 33 percent minor soils.

Bluelick soils are gently sloping to strongly sloping. They formed in loess and in the underlying cherty limestone residuum. They are on ridgetops and side slopes. Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 53 inches thick. The upper part is brown, firm silty clay loam. The next part is strong brown, mottled, firm silty clay. Below this is yellowish red, firm silty clay. The lower part of the subsoil is yellowish red, mottled, firm very cobbly silty clay.

Goss soils are moderately steep and steep. They formed in cherty limestone or dolomite residuum. They are on side slopes. Typically, the surface layer is very dark grayish brown, friable very cobbly silt loam about 3

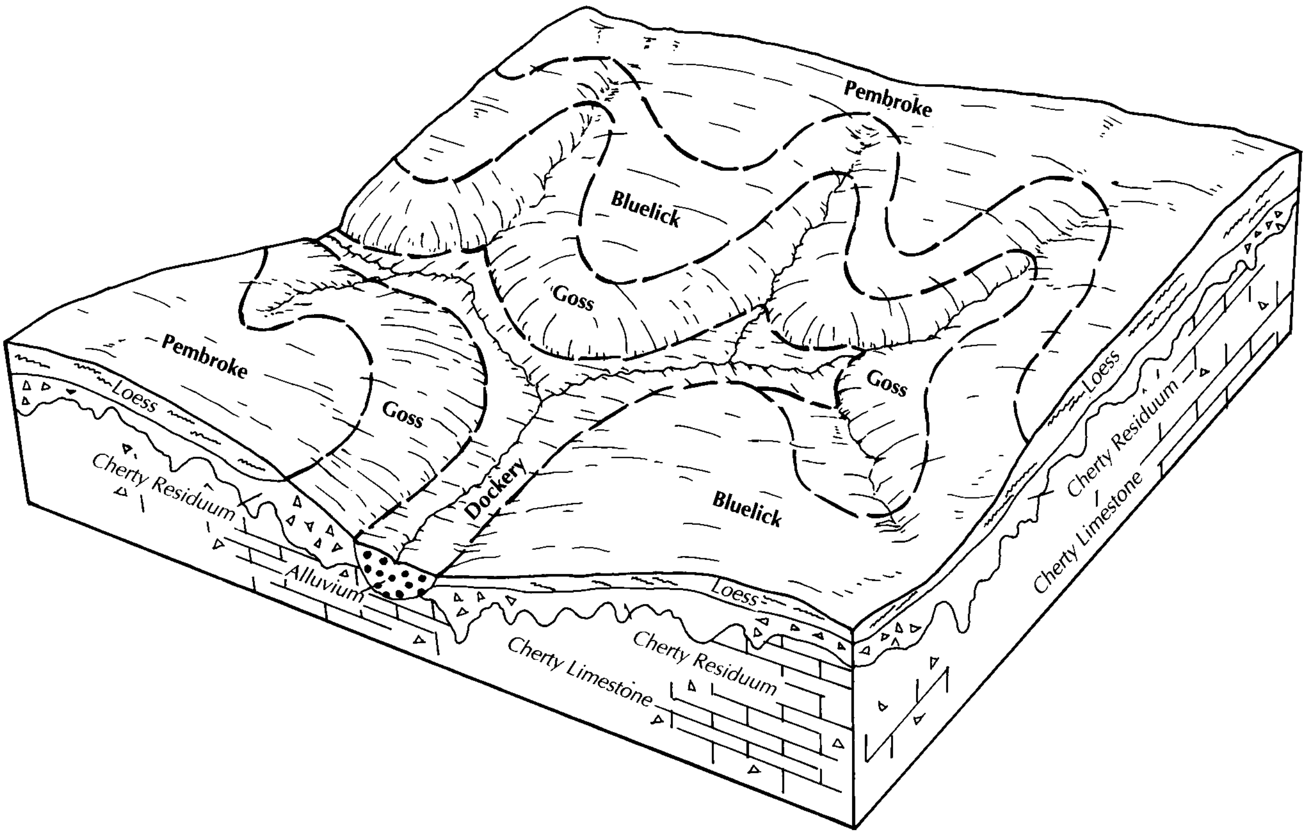


Figure 3.—Typical pattern of soils and parent material in the Bluelick-Goss-Pembroke association.

inches thick. The subsurface layer is friable very cobbly silt loam about 12 inches thick. It is brown in the upperpart and pale brown in the lower part. The subsoil is about 40 inches thick. The upper part is yellowish brown, firm very cobbly silt loam. The next part is yellowish red, mottled, firm very cobbly clay. The lower part is brownish yellow, mottled, very firm very cobbly clay. The substratum to a depth of 60 inches or more is strong brown and yellowish brown, very firm very cobbly clay.

Pembroke soils are gently sloping to strongly sloping. They formed in loess. They are on ridgetops, side slopes, and foot slopes. Typically, the surface soil is dark brown, friable silt loam about 11 inches thick. The subsoil is firm silty clay loam about 49 inches thick. The upper part is dark brown, the next part is brown and strong brown, and the lower part is yellowish red and is mottled.

Minor in this association are Dameron soils and the somewhat poorly drained Dockery soils on flood plains and the somewhat poorly drained Pershing soils on ridgetops and side slopes. Dameron soils have a thick, dark surface layer and do not have red colors in the profile.

About 70 percent of the acreage in this association has been cleared. The cleared areas are used for row crops, such as corn, soybeans, and grain sorghum, or for pasture and hay. Woodland is principally in strongly sloping to steep areas that have too many rock fragments in the surface layer to be suitable for other uses. Narrow areas along streambanks on flood plains also are wooded. Gently sloping and moderately sloping areas that do not have rock fragments in the root zone are generally used for row crops. Erosion is the major hazard affecting all cultivated areas and poorly managed pastures.

The soils in this association are suitable for sanitary facilities and building site development if proper design and installation procedures are used. Large stones are a limitation in areas of Goss soils, and the slope and shrinking and swelling of the subsoil are limitations in areas of all the major soils.

5. Maplewood-Paintbrush-Eldon Association

Very deep, gently sloping to strongly sloping, somewhat poorly drained to well drained soils that formed in loess and cherty limestone or dolomite residuum; on uplands

The landscape of this association consists of long main ridgetops with numerous lateral side ridges separated by long side slopes and narrow branching drainageways (fig. 4). Scattered hedgerows, crop fields, and wooded draws divide extensive areas of pasture and hayland. The native vegetation was mixed prairie and hardwood forest.

This association makes up about 18 percent of the county. It is about 28 percent Maplewood and similar soils, 26 percent Paintbrush and similar soils, 12 percent Eldon and similar soils, and 34 percent minor soils.

Maplewood soils are gently sloping and are somewhat poorly drained. They formed in loess and in the underlying cherty limestone and dolomite residuum. They are on side slopes. Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsoil is about 54 inches thick. The upper part is brown, mottled, firm silty clay loam and silty clay. The next part is a very firm and dense layer of brown, mottled silty clay loam. The lower part is multicolored, firm very cobbly silty clay, very cobbly clay, and clay.

Paintbrush soils are gently sloping and moderately sloping and are moderately well drained. They formed in loess and in the underlying cherty limestone and dolomite residuum. They are on ridgetops and side slopes. Typically, the surface layer is very dark grayish brown, very friable silt loam about 9 inches thick. The subsoil is about 51 inches thick. The upper part is dark brown, friable silty clay loam and dark yellowish brown, mottled, firm silty clay loam. The next part is a very firm

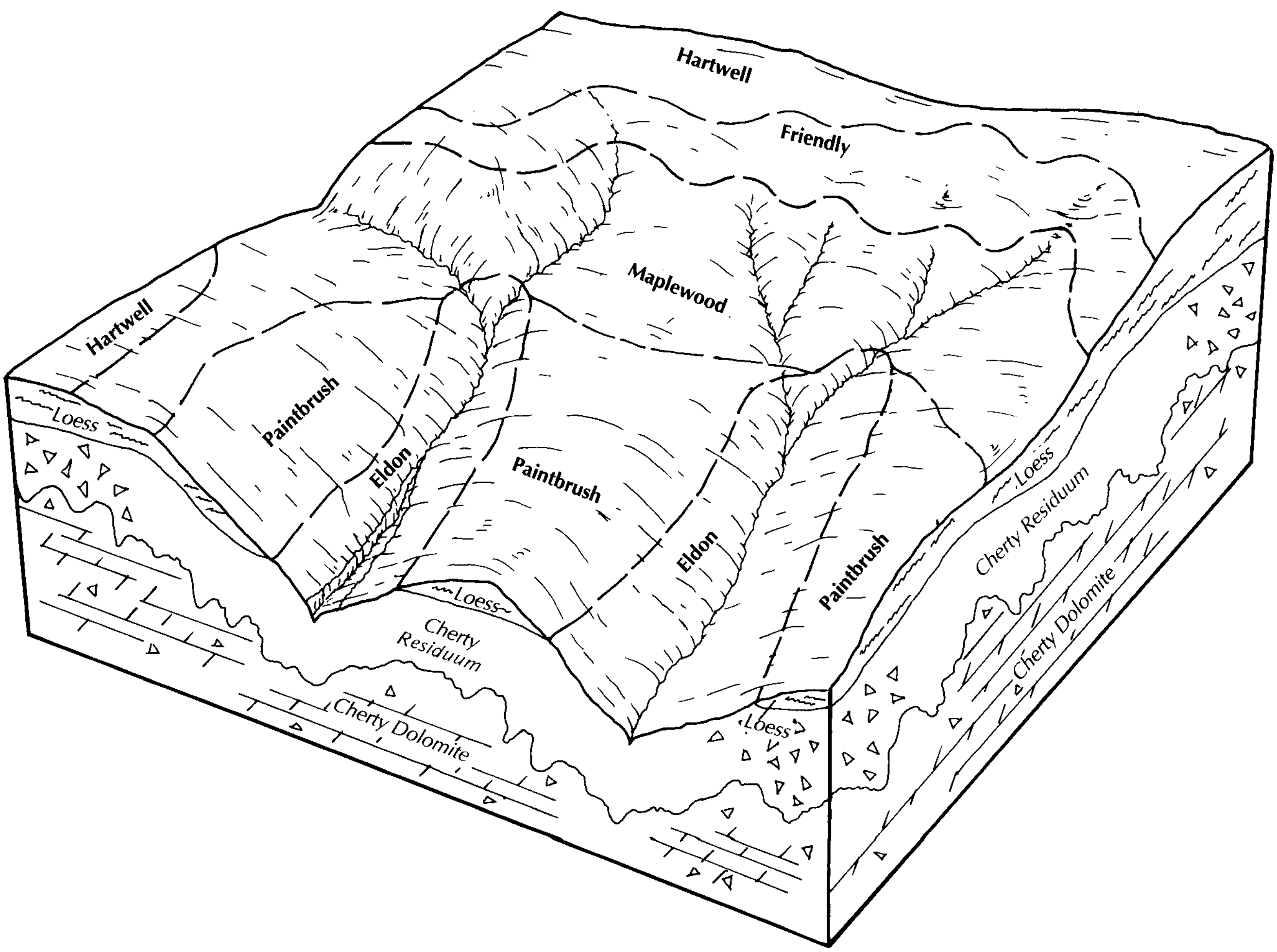


Figure 4.—Typical pattern of soils and parent material in the Maplewood-Paintbrush-Eldon association.

and dense layer of grayish brown, mottled extremely cobbly silty clay loam; brown, mottled extremely cobbly clay loam; and strong brown, mottled gravelly clay loam. The lower part of the subsoil is mottled red and strong brown, firm clay.

Eldon soils are moderately sloping and strongly sloping and are well drained. They formed in cherty limestone and dolomite residuum. They are on side slopes. Typically, the surface layer is very dark brown, friable gravelly silt loam about 7 inches thick. The subsoil is about 53 inches thick. The upper part is dark brown, firm very gravelly silty clay loam and yellowish red, firm very cobbly silty clay loam. The next part is red, firm very gravelly clay. The lower part is multicolored, firm gravelly clay and clay.

Minor in this association are Friendly soils, which are similar to the Maplewood soils; Hartwell soils, which have a thick, dark surface layer and are on ridgetops; and Pershing soils, which do not have red colors or a dense layer and are on foot slopes.

Most of the acreage in this association is used for hay and pasture. Crops are grown in scattered areas throughout the association, especially in the higher landscape positions where rooting depth is greatest. Some woodland is also in areas of this association, principally in draws and along fencerows. In most areas, the soils in this association have only limited suitability for row crops because of a dense layer in the subsoil or stones on the surface. Erosion is a hazard affecting all cultivated areas and poorly managed pastures. Surface wetness caused by a seasonal high water table is a concern during extended wet periods in areas of Maplewood and Paintbrush soils.

Most areas of this association are suitable for sanitary facilities and building site development if proper design and installation procedures are used. Wetness and shrinking and swelling of the subsoil are the main limitations.

6. Arispe-Macksburg-Greenton Association

Very deep and deep, gently sloping and moderately sloping, somewhat poorly drained soils that formed in loess and limestone and shale residuum; on uplands

The landscape of this association consists of long, broad, branching main ridges with numerous lateral side ridges. Long, concave side slopes between the main ridges begin a pattern of branching drainage that converges to form small flood plains (fig. 5). The native vegetation was prairie grasses.

This association makes up about 32 percent of the county. It is about 52 percent Arispe soils, 25 percent Macksburg soils, 11 percent Greenton soils, and 12 percent minor soils.

Arispe soils are gently sloping and moderately sloping. They formed in loess. They are on side slopes. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 43 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam. The next part is dark grayish brown, mottled, firm silty clay. The lower part is gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is gray, mottled, firm silty clay loam.

Macksburg soils are gently sloping. They formed in loess. They are on ridgetops. Typically, the surface layer is black, friable silt loam about 6 inches thick. The subsurface layer is about 12 inches thick. It is very dark gray, firm silt loam in the upper part and very dark grayish brown, mottled, firm silty clay loam in the lower part. The subsoil is about 42 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam. The next part is mottled dark grayish brown, dark yellowish brown, and yellowish brown, firm silty clay. Below this is mottled grayish brown and light olive brown, firm silty clay. The lower part of the subsoil to a depth of 60 inches or more is grayish brown, mottled, firm silty clay loam.

Greenton soils are gently sloping and moderately sloping. They formed in a thin mantle of loess and in the underlying limestone and shale residuum. They are on side slopes. Typically, the surface layer is very dark grayish brown, friable silt loam or silty clay loam about 7 inches thick. The subsoil is about 31 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam. The next part is grayish brown, mottled, firm silty clay loam. The lower part is brown and yellowish brown, mottled, firm silty clay. The substratum is yellowish brown, mottled, firm silty clay. Soft, platy shale is at a depth of about 48 inches.

Minor in this association are the poorly drained Otter soils on flood plains.

Most of the acreage in this association is used for row crops, such as corn, soybeans, grain sorghum, and winter wheat. Some areas are used for pasture and hay. Most areas are suitable for cultivated crops. Erosion is the major hazard affecting all cultivated areas and poorly managed pastures. Surface wetness caused by a seasonal high water table is a concern in areas of all the major soils during extended wet periods.

The soils in this association are suitable for sanitary facilities and building site development if proper design and installation procedures are used. Wetness and shrinking and swelling of the subsoil are the main limitations.

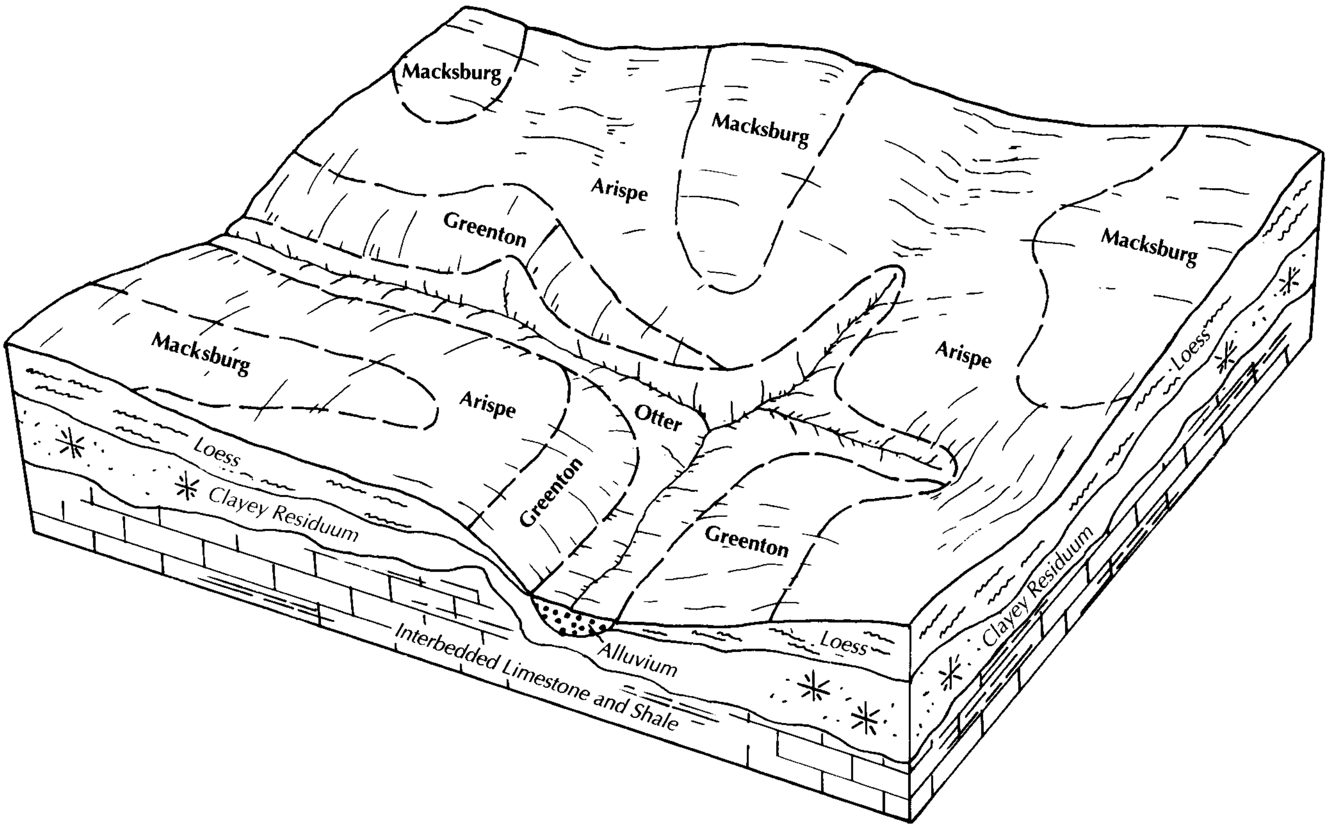


Figure 5.—Typical pattern of soils and parent material in the Arispe-Macksburg-Greenton association.

7. Eldon-Paintbrush-Bahner Association

Very deep, gently sloping to strongly sloping, moderately well drained and well drained soils that formed in loess and cherty limestone or dolomite residuum; on uplands

The landscape of this association consists of long main ridgetops with numerous lateral side ridges. Sloping areas between the side ridges begin a branching pattern of drainage that converges to form small flood plains adjacent to larger streams. Strongly sloping to steep areas with prominent drainage patterns border these bottom-land areas. The native vegetation was mixed prairie and hardwood forest.

This association makes up about 7 percent of the county. It is about 48 percent Eldon and similar soils, 20 percent Paintbrush soils, 10 percent Bahner soils, and 22 percent minor soils.

Eldon soils are moderately sloping and strongly sloping and are well drained. They are on side slopes. Typically, the surface layer is very dark brown, friable gravelly silt loam about 7 inches thick. The subsoil is about 53 inches thick. The upper part is dark brown, firm very gravelly silty clay loam and yellowish red, firm very cobbly silty clay loam. The next part is red, firm very gravelly clay. The lower part is multicolored, firm gravelly clay and clay.

Paintbrush soils are gently sloping and moderately sloping and are moderately well drained. They are on ridgetops and side slopes. Typically, the surface layer is very dark grayish brown, very friable silt loam about 9 inches thick. The subsoil is about 51 inches thick. The upper part is dark brown, friable silty clay loam and dark yellowish brown, mottled, firm silty clay loam. The next part is a very firm and dense layer of grayish brown, mottled extremely cobbly silty clay loam; brown, mottled extremely cobbly clay loam; and strong brown, mottled gravelly clay loam. The lower part of the subsoil is mottled red and strong brown, very firm clay.

Bahner soils are gently sloping and moderately sloping and are moderately well drained. They are on ridgetops and side slopes. Typically, the surface soil is dark brown, friable silt loam about 9 inches thick. The subsoil is about 51 inches thick. The upper part is dark brown and strong brown, firm silty clay loam. The next part is a very firm and dense layer of yellowish red and pale brown, mottled extremely gravelly clay loam. The

lower part of the subsoil is red, mottled, very firm gravelly clay.

Minor in this association are the well drained Dameron and somewhat poorly drained Dockery soils on flood plains; the somewhat poorly drained Pershing soils on ridgetops, side slopes, and foot slopes; and the somewhat poorly drained Friendly and Maplewood soils on ridgetops and side slopes.

About 60 percent of the acreage in this association has been cleared. The cleared areas are used mainly for pasture and hay. A limited acreage is used for grain sorghum. Woodland is principally in areas that are too rocky to be suitable for other uses. Narrow areas along streambanks on flood plains are also wooded. Gently sloping and moderately sloping areas that have a silty surface layer are generally used for hay or pasture. Erosion is the major hazard affecting all cultivated areas and poorly managed pastures.

The soils in this association are suitable for sanitary facilities and building site development if proper design and installation procedures are used. Shrinking and swelling of the subsoil is a limitation in all of the major soils. The slope is a limitation in areas of the strongly sloping Eldon soils. Wetness is a limitation in areas of Bahner and Paintbrush soils.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Greenton silt loam, 2 to 5 percent slopes, eroded, is a phase of the Greenton series.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, quarries, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils.

Soil Descriptions

10A—Hartwell silt loam, 0 to 2 percent slopes. This very deep, nearly level, somewhat poorly drained soil is on ridgetops in the uplands. Individual areas are long and narrow and range from about 50 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 6 inches; very dark grayish brown, friable silt loam

Subsurface layer:

6 to 9 inches; very dark grayish brown, friable silt loam

9 to 12 inches; dark grayish brown, friable silt loam

Subsoil:

12 to 20 inches; black, mottled, firm silty clay

20 to 36 inches; dark grayish brown and grayish brown, mottled, firm silty clay and silty clay loam

36 to 55 inches; gray, mottled, firm silty clay loam

Substratum:

55 to 60 inches; gray, mottled, firm silty clay loam

In some areas the surface soil is less than 10 inches thick.

Important soil properties—

Permeability: Slow
Surface runoff: Slow
Available water capacity: High
Organic matter content: High
Shrink-swell potential: High

Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas of this soil are too narrow to be managed independently, but they can be included with adjacent soils in terrace systems and contour farming operations. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the high content of clay in the subsoil. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is moderately well suited to switchgrass and birdsfoot trefoil. It is moderately suited to big bluestem, indiangrass, ladino clover, and tall fescue. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing footings, foundations, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage help to prevent the damage caused by shrinking and swelling, frost action, and wetness.

The land capability classification is IIe. No woodland ordination symbol is assigned.

10B2—Hartwell silt loam, 1 to 3 percent slopes, eroded. This very deep, very gently sloping and gently sloping, somewhat poorly drained soil is on side slopes in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 50 to 500 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; very dark grayish brown, friable silt loam

Subsoil:
7 to 24 inches; very dark grayish brown and dark grayish brown, mottled, firm silty clay
24 to 39 inches; gray, mottled, firm silty clay
39 to 53 inches; dark gray and gray, mottled, firm silty clay loam

Substratum:
53 to 60 inches; gray, mottled, firm silty clay loam

In some places the surface layer is silty clay loam.

Included with this soil in mapping are small areas of Friendly soils. These soils have a dense layer in the subsoil. They are on the lower parts of the slope. They make up about 5 percent of the unit.

Important properties of the Hartwell soil—

Permeability: Slow
Surface runoff: Medium
Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet

Most areas are used for row crops. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. The hazard of further erosion is severe if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of

permanent grasses or legumes with row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the high content of clay in the subsoil. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is moderately well suited to switchgrass and birdsfoot trefoil. It is moderately suited to big bluestem, indiangrass, ladino clover, and tall fescue. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a moderate limitation. It can be overcome by grading the area.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage help to prevent the damage caused by shrinking and swelling, frost action, and wetness.

The land capability classification is IIe. No woodland ordination symbol is assigned.

11—Hartwell silt loam, foot slopes, 0 to 1 percent slopes. This very deep, nearly level, somewhat poorly drained soil is on foot slopes in the uplands. Individual areas are oblong and range from about 50 to 200 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches; very dark grayish brown, friable silt loam

Subsurface layer:
8 to 14 inches; dark grayish brown, friable silt loam

Subsoil:
14 to 28 inches; very dark grayish brown and dark grayish brown, mottled, firm silty clay
28 to 42 inches; gray, mottled, firm silty clay
42 to 53 inches; grayish brown, mottled, firm silty clay

Substratum:
53 to 60 inches; gray, mottled, firm silty clay loam

In some areas the subsurface layer is very dark grayish brown.

Included with this soil in mapping are several areas of the poorly drained Otter soils. These soils are in areas adjacent to small drainageways. They make up about 5 percent of the unit.

Important properties of the Hartwell soil—

Permeability: Slow
Surface runoff: Slow
Available water capacity: Moderate
Organic matter content: High
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 0.5 foot to 1.5 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes. Wetness caused by poor internal drainage is the main limitation. Land grading improves surface drainage in ponded areas. Diversions help to control surface runoff from the adjacent uplands. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the high content of clay in the subsoil. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

This soil is moderately well suited to switchgrass. It is moderately suited to big bluestem, indiangrass, ladino clover, and tall fescue. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the

damage caused by excessive wetness. Diversions help to control runoff from the adjacent uplands. Properly constructed sewage lagoons can function adequately.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage minimize the damage caused by shrinking and swelling, frost action, and wetness.

The land capability classification is IIw. No woodland ordination symbol is assigned.

12—Haig silt loam. This very deep, nearly level, poorly drained soil is on broad ridgetops in the uplands. Individual areas are irregular in shape and range from about 10 to more than 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface soil:
0 to 10 inches; black, friable silt loam

Subsurface layer:
10 to 16 inches; black, firm silty clay loam

Subsoil:
16 to 20 inches; very dark gray, firm silty clay loam
20 to 28 inches; very dark gray, mottled, firm silty clay
28 to 45 inches; dark grayish brown, mottled, firm silty clay
45 to 60 inches; grayish brown, mottled, firm silty clay loam

Included with this soil in mapping are several areas of the somewhat poorly drained Macksburg soils. These soils are in gently sloping perimeter areas and on rounded ridgetops. They make up about 5 percent of the unit.

Important properties of the Haig soil—

Permeability: Slow
Surface runoff: Slow
Available water capacity: High
Organic matter content: High
Shrink-swell potential: High
Depth to a seasonal high water table: 1 to 2 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes. Wetness caused by poor internal drainage is the major limitation. Land grading improves surface drainage in ponded areas. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Pasture and hay species that tolerate wetness should be selected for planting on this soil. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. The soil is moderately well suited to birdsfoot trefoil, switchgrass, and reed canarygrass. It is moderately suited to big bluestem, indiangrass, alsike clover, ladino clover, and tall fescue.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material can minimize the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage help to prevent the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIw. No woodland ordination symbol is assigned.

15B—Bluelick silt loam, 2 to 5 percent slopes. This very deep, gently sloping, well drained soil is on ridgetops in the uplands. Individual areas are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; dark brown, friable silt loam

Subsoil:
7 to 36 inches; dark brown and brown, firm silty clay loam
36 to 60 inches; strong brown, firm very cobbly silty clay

In some places the lower part of the subsoil is silty clay loam.

Important soil properties—

Permeability: Moderately slow
Surface runoff: Medium
Available water capacity: Moderate
Organic matter content: Low
Shrink-swell potential: Moderate

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Erosion

is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas are too narrow to be managed independently, but they can be included with adjacent soils in terrace systems and contour farming operations. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. This soil is well suited to big bluestem, indiangrass, switchgrass, and most other warm-season grasses; to alfalfa, ladino clover, red clover, and most other legumes; and to orchardgrass, tall fescue, timothy, and most other cool-season grasses. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Because of the moderately slow permeability in the subsoil, septic tank absorption fields generally do not function adequately unless the size of the absorption field is increased. Properly constructed sewage lagoons can be used. The slope and seepage are moderate limitations on sites for sewage lagoons. They can be overcome by grading the area and by sealing the bottom of the lagoon.

Low strength, the shrink-swell potential, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IIe. The woodland ordination symbol is 3A.

15C—Bluelick silt loam, 5 to 9 percent slopes. This very deep, moderately sloping, well drained soil is on narrow ridgetops and side slopes in the uplands. Individual areas are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches; dark brown, friable silt loam

Subsoil:
8 to 14 inches; strong brown, firm silty clay loam
14 to 31 inches; yellowish red, firm silty clay
31 to 60 inches; yellowish red, firm very cobbly silty clay and very cobbly clay

In some places the lower part of the subsoil is silty clay loam.

Included with this soil in mapping are small areas of Eldon soils. These soils have coarse fragments in the upper part of the subsoil. They are on the lower slopes. They make up about 5 percent of the unit.

Important properties of the Bluelick soil—

Permeability: Moderately slow
Surface runoff: Medium
Available water capacity: Moderate
Organic matter content: Low
Shrink-swell potential: Moderate

Most areas are used for hay and pasture. Row crops are grown on a small acreage. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. In areas where construction cuts are made, the cherty residuum will be nearer to the surface, resulting in droughty areas that may be gravelly in places. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. This soil is well suited to big bluestem, indiangrass, switchgrass, and most other warm-season grasses; to alfalfa, ladino clover, red

clover, and most other legumes; and to orchardgrass, tall fescue, timothy, and most other cool-season grasses. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. The slope is a limitation on sites for small commercial buildings. It can be overcome by grading the area. Because of the moderately slow permeability in the subsoil, septic tank absorption fields generally do not function adequately unless the size of the absorption field is increased. Properly constructed sewage lagoons can be used. The slope is a limitation on sites for sewage lagoons. It can be overcome by grading the area.

Low strength, the shrink-swell potential, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

15D2—Bluelick silt loam, 9 to 16 percent slopes, eroded. This very deep, strongly sloping and moderately steep, well drained soil is on side slopes in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 5 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; brown, friable silt loam

Subsoil:
7 to 12 inches; brown, firm silty clay loam
12 to 30 inches; strong brown and yellowish red, mottled, firm silty clay
30 to 60 inches; yellowish red, mottled, firm very cobbly silty clay

In some places the lower part of the subsoil is silty clay loam or silty clay.

Included with this soil in mapping are small areas of Eldon soils. These soils have coarse fragments in the upper part of the subsoil. They are on the lower slopes. They make up about 5 percent of the unit.

Important properties of the Bluelick soil—

Permeability: Moderately slow
Surface runoff: Rapid
Available water capacity: Moderate
Organic matter content: Low
Shrink-swell potential: Moderate

Most areas are used for hay, pasture, or woodland. This soil is suited to hay and pasture. It is suited to row crops on a limited basis. The hazard of further erosion is severe if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Grassed backslope terraces or narrow-base terraces reduce the slope. They may be more desirable than conventional terraces if row crops are to be grown. In areas where construction cuts are made, the cherty residuum will be nearer to the surface, resulting in droughty areas that may be gravelly in places. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. This soil is well suited to switchgrass, ladino clover, red clover, tall fescue, and timothy. It is moderately well suited to big bluestem, indiangrass, alfalfa, and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is suited to building site development if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Land shaping can modify the slope, or the dwellings can be designed so that they conform to the natural slope of the land. Because of the slope and the moderately slow permeability in the subsoil, septic tank

absorption fields generally do not function adequately unless the size of the absorption field is increased and the absorption field is installed across the slope. Properly constructed sewage lagoons can be used. The slope is a severe limitation on sites for sewage lagoons. It can be overcome by grading the area, or sewage can be piped to adjacent areas that are more suitable.

Low strength, the shrink-swell potential, the slope, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Some cutting and filling may be necessary because of the slope, or roads can be designed so that they conform to the natural slope of the land. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IVe. The woodland ordination symbol is 3A.

17B—Pembroke silt loam, 2 to 5 percent slopes. This very deep, gently sloping, well drained soil is on ridgetops and foot slopes in the uplands. Individual areas are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface soil:
0 to 11 inches; dark brown, friable silt loam

Subsoil:
11 to 18 inches; dark brown, firm silty clay loam
18 to 41 inches; brown and strong brown, firm silty clay loam
41 to 60 inches; yellowish red, mottled, firm silty clay loam

In places the lower part of the subsoil has grayish brown mottles. In some areas the surface layer is dark grayish brown. In other areas the surface layer is very dark grayish brown and is more than 10 inches thick.

Important soil properties—

Permeability: Moderate
Surface runoff: Medium
Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: Moderate

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas are too narrow to be managed independently, but they can be included with adjacent soils in terrace systems and contour farming operations. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. On foot slopes, surface runoff from the adjacent uplands can be reduced by constructing diversions. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. This soil is well suited to big bluestem, indiangrass, switchgrass, and most other warm-season grasses; to alfalfa, ladino clover, red clover, and most other legumes; and to orchardgrass, tall fescue, timothy, and most other cool-season grasses. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Septic tank absorption fields generally function adequately in areas of this soil.

Low strength, the shrink-swell potential, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IIe. The woodland ordination symbol is 3A.

17C—Pembroke silt loam, 5 to 9 percent slopes. This very deep, moderately sloping, well drained soil is on narrow ridgetops, side slopes, and foot slopes in the uplands. Individual areas are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Figure 6.—Corn and grasses in an area of Pembroke silt loam, 5 to 9 percent slopes.

Surface layer:
0 to 8 inches; dark brown, friable silt loam

Subsoil:
8 to 15 inches; yellowish brown, friable silty clay loam
15 to 39 inches; dark yellowish brown, firm silty clay loam
39 to 60 inches; dark brown and strong brown, firm silty clay loam

In places the surface layer is dark grayish brown. In some areas the lower part of the subsoil has grayish brown mottles. In other areas the lower part of the subsoil is very cobbly silty clay. In some places the surface layer is more than 10 inches thick.

Important soil properties—

Permeability: Moderate
Surface runoff: Medium
Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: Moderate

Most areas are used for row crops, hay, or pasture (fig. 6). This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop

rotations. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. On foot slopes, surface runoff from the adjacent uplands can be reduced by constructing diversions. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. This soil is well suited to big bluestem, indiangrass, switchgrass, and most other warm-season grasses; to alfalfa, ladino clover, red clover, and most other legumes; and to orchardgrass, tall fescue, timothy, and most other cool-season grasses. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Land shaping can modify the slope, or the buildings can be designed so that they conform to the natural slope of the land. Septic tank absorption fields generally function adequately in areas of this soil.

Low strength, the shrink-swell potential, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

17D—Pembroke silt loam, 9 to 16 percent slopes. This very deep, strongly sloping and moderately steep, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from about 5 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches; dark brown, friable silt loam

Subsurface layer:
5 to 9 inches; dark brown, friable silty clay loam

Subsoil:
9 to 23 inches; dark brown, firm silty clay loam
23 to 60 inches; strong brown and yellowish red, firm silty clay loam

In some places the lower part of the subsoil is very cobbly silty clay.

Important soil properties—

Permeability: Moderate
Surface runoff: Rapid
Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: Moderate

Most areas are used for hay, pasture, or woodland. This soil is suited to hay and pasture. It is suited to row crops on a limited basis. The hazard of erosion is severe if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Grassed backslope terraces or narrow-base terraces reduce the slope. They may be more desirable than conventional terraces if row crops are to be grown. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. This soil is well suited to switchgrass, ladino clover, red clover, tall fescue, and timothy. It is moderately well suited to big bluestem, indiangrass, alfalfa, and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is suited to building site development if proper design and installation procedures are used. Constructing foundations, footings, and basement walls

with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Land shaping can modify the slope, or the buildings can be designed so that they conform to the natural slope of the land. Septic tank absorption fields should be installed across the slope.

Low strength, the shrink-swell potential, the potential for frost action, and the slope are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Some cutting and filling may be necessary because of the slope, or roads can be designed so that they conform to the natural slope of the land. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IVe. The woodland ordination symbol is 3A.

20B—Pershing silt loam, 2 to 5 percent slopes. This very deep, gently sloping, somewhat poorly drained soil is on ridgetops in the uplands. Individual areas are long and narrow and range from about 5 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches; very dark grayish brown, friable silt loam

Subsoil:
8 to 19 inches; yellowish brown and dark yellowish brown, friable and firm silty clay loam
19 to 41 inches; grayish brown, mottled, firm silty clay and silty clay loam
41 to 54 inches; light brownish gray, mottled, firm silty clay loam

Substratum:
54 to 60 inches; gray, mottled, firm silty clay loam

In some places the surface layer is dark grayish brown.

Important soil properties—

Permeability: Slow
Surface runoff: Medium
Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 2 to 4 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas are too narrow to be managed independently, but they can be included with adjacent soils in terrace systems and contour farming operations. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. Seedling mortality and windthrow are management concerns. Planting container-grown nursery stock or reinforcement planting improves the seedling survival rate. Thinning the stands less intensively and more frequently reduces the windthrow hazard.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a moderate limitation on sites for sewage lagoons. It can be overcome by grading the area.

The shrink-swell potential, low strength, the potential for frost action, and wetness are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3C.

20B2—Pershing silt loam, 2 to 5 percent slopes, eroded. This very deep, gently sloping, somewhat poorly drained soil is on side slopes in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 5 to 40 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; dark brown, friable silt loam

Subsoil:
7 to 15 inches; brown, mottled, firm silty clay loam
15 to 40 inches; grayish brown and light brownish gray, mottled, firm silty clay
40 to 60 inches; gray, mottled, firm silty clay loam

In some areas the surface layer is grayish brown or dark grayish brown. In other areas the subsoil is underlain by weathered shale bedrock.

Important soil properties—

Permeability: Slow
Surface runoff: Medium
Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 2 to 4 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. The hazard of further erosion is severe if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. Seedling mortality and windthrow are management concerns. Planting container-grown nursery stock improves the seedling survival rate. Thinning the stands less intensively and more frequently reduces the windthrow hazard.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a moderate limitation on sites for sewage lagoons. It can be overcome by grading the area.

The shrink-swell potential, low strength, the potential for frost action, and wetness are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3C.

20C2—Pershing silt loam, 5 to 9 percent slopes, eroded. This very deep, moderately sloping, somewhat poorly drained soil is on side slopes in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 10 to 60 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches; brown, very friable silt loam

Subsoil:
5 to 9 inches; pale brown, friable silty clay loam
9 to 13 inches; pale brown, mottled, firm silty clay loam
13 to 48 inches; grayish brown, mottled, firm silty clay

48 to 60 inches; grayish brown, mottled, firm silty clay loam

In some areas the surface layer is silty clay loam. In other areas the subsoil is underlain by soft, weathered shale.

Included with this soil in mapping are small areas of the well drained Pembroke soils in convex positions. These soils make up about 5 percent of the unit.

Important properties of the Pershing soil—

Permeability: Slow
Surface runoff: Medium
Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 2 to 4 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. The hazard of further erosion is severe if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate wetness should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. Seedling mortality and windthrow are management concerns. Planting container-grown nursery stock or reinforcement planting improves the seedling survival rate. Thinning the stands less intensively and more frequently reduces the windthrow hazard.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a severe limitation on sites for sewage lagoons. It can be overcome by grading the area.

The shrink-swell potential, low strength, the potential for frost action, and wetness are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3C.

21B2—Pershing silt loam, foot slopes, 2 to 5 percent slopes, eroded. This very deep, gently sloping, somewhat poorly drained soil is on foot slopes in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 5 to 80 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches; dark brown, friable silt loam

Subsoil:
6 to 14 inches; brown, mottled, firm silty clay loam and silty clay
14 to 21 inches; yellowish brown and light brownish gray, firm silty clay
21 to 39 inches; light brownish gray, mottled, firm silty clay
39 to 60 inches; light gray, mottled, firm silty clay loam

In some areas the surface layer is silty clay loam. In other areas the soil does not have gray colors in the subsoil.

Important soil properties—

Permeability: Slow
Surface runoff: Medium

Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 2 to 4 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. The hazard of further erosion is severe if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Surface runoff from the adjacent uplands can be reduced by constructing diversions. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. Seedling mortality and windthrow are management concerns. Planting container-grown nursery stock or reinforcement planting improves the seedling survival rate. Thinning the stands less intensively and more frequently reduces the windthrow hazard.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Diversions help to control runoff from the adjacent uplands. Properly constructed sewage lagoons can function adequately. The slope is a moderate limitation on sites for sewage lagoons. It can be overcome by grading the area.

The shrink-swell potential, low strength, the potential for frost action, and wetness are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3C.

23B—Macksburg silt loam, 1 to 5 percent slopes. This very deep, very gently sloping and gently sloping, somewhat poorly drained soil is on broad ridgetops in the uplands. Individual areas are long and narrow and range from about 10 to more than 1,000 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches; black, friable silt loam

Subsurface layer:
6 to 11 inches; very dark gray, firm silt loam
11 to 18 inches; very dark grayish brown, mottled, firm silty clay loam

Subsoil:
18 to 23 inches; dark grayish brown, mottled, firm silty clay loam
23 to 30 inches; mottled dark grayish brown, dark yellowish brown, and yellowish brown, firm silty clay
30 to 44 inches; grayish brown and light olive brown, mottled, firm silty clay
44 to 60 inches; grayish brown, mottled, firm silty clay loam

In places the dark surface soil is less than 16 inches thick. In some areas the lower part of the subsurface layer is dark grayish brown or grayish brown. In other areas the subsoil contains more than 42 percent clay.

Included with this soil in mapping are small areas of the poorly drained Haig soils. These soils are on nearly level summits of the widest ridgetops. They make up about 5 percent of the unit.

Important properties of the Macksburg soil—

Permeability: Moderately slow
Surface runoff: Medium
Available water capacity: High
Organic matter content: High

Shrink-swell potential: High
Depth to a seasonal high water table: 2 to 4 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas are too narrow to be managed independently, but they can be included with adjacent soils in terrace systems and contour farming operations. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. Wetness is a severe limitation on sites for sewage lagoons. It can be overcome by sealing the bottom of the lagoon. The slope also is a moderate limitation. It can be overcome by grading the area.

The shrink-swell potential, low strength, the potential for frost action, and the wetness are severe limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIe. No woodland ordination symbol is assigned.

24B2—Arispe silt loam, 2 to 5 percent slopes, eroded. This very deep, gently sloping, somewhat poorly drained soil is on side slopes and in concave areas at the upper part of drainageways in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 10 to several hundred acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches; very dark grayish brown, friable silt loam

Subsoil:
8 to 14 inches; dark grayish brown, mottled, firm silty clay loam
14 to 30 inches; dark grayish brown, mottled, firm silty clay
30 to 51 inches; gray, mottled, firm silty clay loam

Substratum:
51 to 60 inches; gray, mottled, firm silty clay loam

In places the dark surface soil is more than 10 inches thick. In some areas the subsoil is underlain by soft, weathered shale at a depth of 40 to 60 inches. In other areas the surface layer is silty clay loam.

Important soil properties—

Permeability: Slow
Surface runoff: Medium
Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 2 to 4 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. The hazard of further erosion is severe if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of permanent grasses or

legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a moderate limitation on sites for sewage lagoons. It can be overcome by grading the area.

The shrink-swell potential, low strength, the potential for frost action, and wetness are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIe. No woodland ordination symbol is assigned.

24C2—Arispe silt loam, 5 to 9 percent slopes, eroded. This very deep, moderately sloping, somewhat poorly drained soil is on side slopes and in concave areas at the upper part of drainageways in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are oblong and range from about 5 to 40 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
- 0 to 8 inches; very dark grayish brown, friable silt loam

Subsoil:
- 8 to 11 inches; dark grayish brown, mottled, firm silty clay loam
- 11 to 19 inches; brown, mottled, firm silty clay loam
- 19 to 42 inches; mottled yellowish brown and light brownish gray, firm silty clay and silty clay loam
- 42 to 60 inches; light brownish gray, mottled, firm silty clay loam

In some areas the subsoil is underlain by soft, weathered shale at a depth of 40 to 60 inches. In other areas the surface layer is silty clay loam. Some areas are gently sloping.

Important soil properties—

Permeability: Moderately slow
Surface runoff: Medium
Available water capacity: High
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 2 to 4 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. The hazard of further erosion is severe if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving

crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a severe limitation on sites for sewage lagoons. It can be overcome by grading the area.

The shrink-swell potential, low strength, the potential for frost action, and wetness are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

28B—Greenton silt loam, foot slopes, 2 to 5 percent slopes. This very deep, gently sloping, somewhat poorly drained soil is on foot slopes in the uplands. Individual areas are oblong and range from about 15 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches; very dark gray, friable silt loam

Subsoil:
6 to 13 inches; very dark grayish brown, firm silty clay loam
13 to 18 inches; very dark grayish brown, mottled, firm silty clay loam
18 to 24 inches; dark grayish brown, mottled, firm silty clay loam
24 to 48 inches; olive gray, mottled, firm silty clay

Substratum:
48 to 60 inches; gray, mottled, firm silty clay

In some places the dark surface soil is less than 10 inches thick.

Included with this soil in mapping are areas of the well drained Dameron and poorly drained Otter soils. These soils are on flood plains at the lower elevations. They make up about 5 percent of the unit.

Important properties of the Greenton soil—

Permeability: Slow
Surface runoff: Medium
Available water capacity: Moderate
Organic matter content: High
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 3 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Diversions reduce surface runoff from the adjacent uplands. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Diversions help to control runoff from the adjacent uplands. Properly constructed sewage lagoons can function adequately. The slope is a moderate limitation on sites for sewage lagoons. It can be overcome by grading the area.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for

local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIe. No woodland ordination symbol is assigned.

28B2—Greenton silt loam, 2 to 5 percent slopes, eroded. This very deep, gently sloping, somewhat poorly drained soil is on side slopes and in concave areas at the upper part of drainageways in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 5 to 150 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 8 inches; very dark grayish brown, friable silt loam

Subsoil:

8 to 19 inches; dark grayish brown, mottled, firm silty clay loam

19 to 31 inches; dark grayish brown and grayish brown, mottled, firm silty clay

31 to 55 inches; mottled yellowish brown, grayish brown, and light brownish gray, firm silty clay

Substratum:

55 to 60 inches; mottled yellowish brown and light brownish gray, firm silty clay

In some areas the very dark grayish brown surface soil is more than 10 inches thick. In other areas the depth to soft shale is less than 60 inches.

Important soil properties—

Permeability: Slow
Surface runoff: Medium
Available water capacity: Moderate
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 3 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. The hazard of further erosion is severe if the soil is used for cultivated crops. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Topsoil from adjacent areas can be added to the exposed channel after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a moderate limitation. It can be overcome by grading the area.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

28C2—Greenton silt loam, bedrock substratum, 5 to 9 percent slopes, eroded. This deep, moderately sloping, somewhat poorly drained soil is on side slopes in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are

irregular in shape and range from about 5 to 160 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; very dark grayish brown, friable silt loam

Subsoil:
7 to 16 inches; dark grayish brown, mottled, firm silty clay loam
16 to 22 inches; grayish brown, mottled, firm silty clay loam
22 to 38 inches; brown and yellowish brown, mottled, firm silty clay

Substratum:
38 to 48 inches; yellowish brown, mottled, firm silty clay

Bedrock:
48 to 60 inches; soft, platy shale

In some areas the dark surface soil is more than 10 inches thick. In other areas the surface layer is silty clay loam.

Important soil properties—

Permeability: Slow
Surface runoff: Medium
Available water capacity: Moderate
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 3 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Further erosion is a hazard if the soil is used for cultivated crops. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Terracing reduces the thickness of the material over the soft shale, resulting in channels that are low in fertility and available water. Topsoil from adjacent areas can be added to the exposed channels after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a severe limitation. It can be overcome by grading the area.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

28C3—Greenton silty clay loam, bedrock substratum, 5 to 9 percent slopes, severely eroded. This deep, moderately sloping, somewhat poorly drained soil is on side slopes in the uplands. Erosion has removed most of the original surface layer. The rest of the surface layer has been mixed with subsoil material by tillage. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 5 to 30 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches; dark brown, friable silty clay loam

Subsoil:
6 to 36 inches; multicolored, firm silty clay loam
36 to 58 inches; yellowish brown and grayish

brown, mottled, very firm silty clay

Bedrock:
58 to 60 inches; soft, platy shale

In many places the surface layer is very dark grayish brown silt loam.

Important soil properties—

Permeability: Slow
Surface runoff: Medium
Available water capacity: Moderate
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1.5 to 3.0 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to hay and pasture. It is suited to row crops and small grain only on a limited basis if contour farming and proper crop rotations are used. In some areas the topsoil has been completely removed by erosion, and the plow layer is mostly subsoil material. The hazard of further erosion is severe if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Terracing reduces the thickness of the material over the soft shale and cuts into the subsoil material, resulting in channels that are low in fertility and available water. Topsoil from adjacent areas can be added to the exposed channels after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a severe limitation. It can be overcome by grading the area.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IVe. No woodland ordination symbol is assigned.

28D2—Greenton silty clay loam, bedrock substratum, 9 to 14 percent slopes, eroded. This deep, strongly sloping, somewhat poorly drained soil is on side slopes in the uplands. Erosion has removed some of the original surface layer. Individual areas are irregular in shape and range from about 5 to 30 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches; very dark grayish brown, friable silty clay loam

Subsoil:
8 to 11 inches; yellowish brown, firm silty clay loam
11 to 23 inches; yellowish brown, mottled, firm silty clay loam and silty clay
23 to 37 inches; mottled yellowish brown and gray, firm silty clay

Substratum:
37 to 49 inches; yellowish brown, mottled, firm silty clay

Bedrock:
49 to 60 inches; soft, platy shale

In some places the surface layer is silt loam.

Important soil properties—

Permeability: Slow
Surface runoff: Rapid
Available water capacity: Moderate
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 3 feet

Most areas are used for hay, pasture, or woodland. This soil is suited to hay and pasture. It is suited to row crops or small grain only on a very limited basis if intensive measures to control erosion are used.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a severe limitation on sites for sewage lagoons. It can be overcome by grading the area.

Low strength, the shrink-swell potential, wetness, and the slope are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Some cutting and filling may be necessary because of the slope, or roads can be designed so that they conform to the natural slope of the land. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by wetness.

The land capability classification is VIe. No woodland ordination symbol is assigned.

31—Otter silt loam. This very deep, nearly level, poorly drained soil is on small flood plains. It is frequently flooded. Individual areas are long and narrow and range from about 30 to several hundred acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches; very dark gray, friable silt loam

Subsurface layer:
9 to 31 inches; very dark gray, friable silt loam

Subsoil:
31 to 60 inches; dark gray, mottled, firm silty clay loam

In some areas the subsurface layer is stratified throughout. In other areas the subsurface layer is dark brown or brown.

Included with this soil in mapping are areas of the well drained Dameron soils. These soils are at the lower elevations. They make up about 5 percent of the unit.

Important properties of the Otter soil—

Permeability: Moderate
Surface runoff: Slow
Available water capacity: Very high
Organic matter content: Very high
Shrink-swell potential: Low
Seasonal high water table: 0.5 foot above to 2 feet below the surface

Most areas are used for row crops, hay, or pasture. Narrow areas along channels are wooded. This soil is suited to corn, soybeans, small grain, and grasses and legumes for pasture and hay. Stream channels make access with farm equipment difficult in some areas. Flooding, ditchbank erosion, and runoff are problems. Flood-control structures may be needed. Timely planting of short-season varieties helps to prevent damage from flooding during the growing season. Careful maintenance of permanent vegetation along stream channels helps to stabilize ditchbanks. Diversions help to control runoff from the adjacent uplands. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

The frequent flooding and the wetness are concerns if this soil is used for hay or pasture. Pasture and hay species that tolerate wetness should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. The soil is moderately suited to alsike clover and reed canarygrass. It is poorly suited or generally unsuited to most other warm-season grasses, legumes, and cool-season grasses. Grazing should be restricted to periods when flooding is not likely.

This soil is suited to trees. The equipment limitation, seedling mortality, and windthrow are management concerns. Equipment should be used only when the soil is dry or frozen. Planting container-grown nursery stock and ridging the soil before planting improve the seedling survival rate. Thinning the stands lightly but frequently reduces the windthrow hazard.

This soil is unsuited to building site development because of the frequent flooding.

The land capability classification is IIIw. The woodland ordination symbol is 3W.

32—Tanglenook silt loam. This very deep, nearly level, poorly drained soil is on high stream flood plains.

It is occasionally flooded. Individual areas are slightly elongated and range from about 10 to 50 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches; very dark gray, friable silt loam

Subsurface layer:
6 to 17 inches; very dark gray silty clay loam that is friable in the upper part and firm in the lower part

Subsoil:
17 to 30 inches; very dark gray, mottled, firm silty clay
30 to 40 inches; dark grayish brown, mottled, firm silty clay
40 to 56 inches; grayish brown, mottled, firm silty clay

Substratum:
56 to 60 inches; grayish brown, mottled, firm silty clay

In some areas the dark upper layers are less than 24 inches thick. In other areas the surface layer is silty clay loam.

Included with this soil in mapping are several areas of the somewhat poorly drained Nevin soils. These soils are in the slightly higher areas on flood plains. They make up about 5 to 10 percent of the unit.

Important properties of the Tanglenook soil—

Permeability: Slow
Surface runoff: Slow
Available water capacity: High
Organic matter content: High
Shrink-swell potential: High
Seasonal high water table: At the surface to 1.5 feet below the surface

Most areas are used for row crops. This soil is suited to corn, soybeans, small grain, and grasses and legumes for pasture and hay. Wetness and flooding are the main limitations in cultivated areas. The wetness is caused by runoff from adjacent hillsides and by poor surface drainage. Diversions help to control runoff from the adjacent uplands. Surface drainage can be improved by land grading or surface ditches. Levees or flood-control structures reduce flood damage and crop loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

The flooding and the wetness are concerns if this soil is used for hay or pasture. Pasture and hay species that tolerate wetness should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. The soil is moderately well suited to reed canarygrass. It is moderately suited to alsike clover and ladino clover. It is poorly suited or generally unsuited to most other warm-season grasses, legumes, and cool-season grasses. Land grading or shallow ditches can remove excess water. Grazing should be restricted to periods when flooding is not likely.

This soil is suited to trees. The equipment limitation, seedling mortality, and windthrow are management concerns. Equipment should be used only when the soil is dry or frozen. Planting container-grown nursery stock and ridging the soil before planting improve the seedling survival rate. Thinning the stands lightly but frequently reduces the windthrow hazard.

This soil is unsuited to building site development because of the occasional flooding.

The land capability classification is IIw. The woodland ordination symbol is 2W.

33—Dockery silt loam. This very deep, nearly level, somewhat poorly drained soil is on flood plains along large streams. It is frequently flooded. Individual areas are long and narrow and range from about 20 to several hundred acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; dark grayish brown, friable silt loam

Substratum:
7 to 60 inches; stratified dark grayish brown, dark brown, and yellowish brown, mottled silt loam

In some areas the underlying material is dark brown. In other areas the soil is very dark grayish brown to a depth of 36 inches or more.

Important soil properties—

Permeability: Moderate
Surface runoff: Slow
Available water capacity: Very high
Organic matter content: Moderate
Shrink-swell potential: Moderate
Depth to a seasonal high water table: 2 to 3 feet

Most areas are used for row crops, pasture, or woodland. This soil is suited to corn, soybeans, small grain, and grasses and legumes. No significant limitations affect cultivated crops if the soil is protected from flooding and runoff from the adjacent uplands. Levees or flood-control structures reduce flood damage and crop loss. Diversions help to control runoff from the adjacent uplands. Timely planting of short-season

varieties helps to prevent damage from flooding during the growing season. In some depressional areas land grading or surface ditches may be needed to reduce wetness. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

The wetness is a problem if this soil is used for hay or pasture. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. The soil is well suited to reed canarygrass. It is moderately well suited to switchgrass, ladino clover, red clover, tall fescue, and timothy. It is moderately suited to big bluestem, indiangrass, and alfalfa. Land grading or surface ditches can remove excess water. Grazing should be restricted to periods when flooding is not likely.

This soil is suited to trees. Many small areas support native woodland. No major hazards or limitations affect planting or harvesting.

This soil is unsuited to building site development because of the frequent flooding.

The land capability classification is IIIw. The woodland ordination symbol is 4A.

34—Arbela silt loam. This very deep, nearly level, poorly drained soil is on high stream flood plains. It is occasionally flooded. Individual areas are slightly elongated and range from about 5 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 16 inches; very dark grayish brown, friable silt loam

Subsurface layer:
16 to 30 inches; dark grayish brown and grayish brown, mottled, friable silt loam

Subsoil:
30 to 50 inches; grayish brown, mottled, firm silty clay loam
50 to 60 inches; light brownish gray, mottled, firm silty clay loam

In some places the dark surface layer is less than 10 inches thick.

Important soil properties—

Permeability: Moderately slow
Surface runoff: Slow
Available water capacity: High
Organic matter content: High
Shrink-swell potential: Moderate
Seasonal high water table: At the surface to 1.5 feet below the surface

Most areas are used for row crops. This soil is suited to corn, soybeans, small grain, and grasses and legumes for pasture and hay. Wetness and flooding are the main limitations in cultivated areas. The wetness is caused by runoff from adjacent hillsides and poor surface drainage. Diversions help to control runoff from the adjacent uplands. Surface drainage can be improved by land grading or surface ditches. Levees or flood-control structures reduce flood damage and crop loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

The flooding and the wetness are concerns if this soil is used for hay or pasture. Pasture and hay species that tolerate wetness should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. The soil is moderately well suited to reed canarygrass. It is moderately suited to alsike clover and ladino clover. It is poorly suited or generally unsuited to most other warm-season grasses, legumes, and cool-season grasses. Land grading or shallow ditches can remove excess water. Grazing should be restricted to periods when flooding is not likely.

This soil is unsuited to building site development because of the occasional flooding.

The land capability classification is IIw. No woodland ordination symbol is assigned.

38—Zook silty clay loam. This very deep, nearly level, poorly drained soil is in depressions on flood plains. It is frequently flooded. Individual areas are irregular in shape and range from about 5 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 4 inches; very dark gray, friable silty clay loam

Subsurface layer:
4 to 19 inches; very dark gray, mottled, firm silty clay loam
19 to 40 inches; very dark gray, firm silty clay

Subsoil:
40 to 60 inches; gray, mottled, firm silty clay

Important soil properties—

Permeability: Slow
Surface runoff: Slow
Available water capacity: Moderate

Organic matter content: Very high
Shrink-swell potential: High
Seasonal high water table: At the surface to 3 feet below the surface

Most areas are used for hay and pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes for pasture and hay. Wetness and flooding are the main limitations affecting cultivated crops. The wetness is caused by poor surface drainage and internal drainage and by runoff from adjacent hillsides. Surface drainage can be improved by land grading or surface ditches. Diversions help to control runoff from the adjacent uplands. Levees or flood-control structures reduce flood damage and crop loss. Timely planting of short-season varieties helps to prevent damage from flooding during the growing season. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

The flooding and the wetness also are limitations if this soil is used for hay or pasture. Pasture and hay species that tolerate wetness should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. The soil is best suited to alsike clover and reed canarygrass. Land grading or shallow ditches can remove excess water. Grazing should be restricted to periods when flooding is not likely.

This soil is unsuited to building site development because of the frequent flooding.

The land capability classification is IIIw. No woodland ordination symbol is assigned.

40—Lamine silt loam. This very deep, nearly level, somewhat poorly drained soil is on high stream flood plains. It is occasionally flooded. Individual areas are slightly elongated and range from about 5 to 60 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches; grayish brown, very friable silt loam

Subsurface layer:
6 to 10 inches; light brownish gray, friable silt loam

Subsoil:
10 to 14 inches; light brownish gray, mottled, firm silty clay loam
14 to 39 inches; grayish brown and light brownish gray, mottled, firm silty clay
39 to 55 inches; gray, mottled, firm silty clay

Substratum:
55 to 60 inches; gray, mottled, firm silty clay

In some areas the subsoil is silty clay loam throughout. In other areas the surface layer is very dark grayish brown.

Important soil properties—

Permeability: Very slow
Surface runoff: Slow
Available water capacity: Moderate
Organic matter content: Low
Shrink-swell potential: High
Depth to a seasonal high water table: 1.0 to 2.5 feet

Most areas are used for row crops. This soil is suited to corn, soybeans, small grain, and grasses and legumes for pasture and hay. Wetness and flooding are the main limitations affecting cultivated crops. The wetness is caused by runoff from adjacent hillsides and by poor surface drainage. Diversions help to control runoff from the adjacent uplands. Surface drainage can be improved by land grading or surface ditches. Levees or flood-control structures reduce flood damage and crop loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

The flooding and the wetness are concerns if this soil is used for hay or pasture. Pasture and hay species that tolerate wetness should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. The soil is moderately well suited to reed canarygrass. It is moderately suited to alsike clover and ladino clover. It is poorly suited or generally unsuited to most other warm-season grasses, legumes, and cool-season grasses. Grazing should be restricted to periods when flooding is not likely.

This soil is suited to trees. The equipment limitation, seedling mortality, and windthrow are management concerns. Equipment should be used only when the soil is dry or frozen. Planting container-grown nursery stock and ridging the soil before planting increase the seedling survival rate. Thinning the stands lightly but frequently reduces the windthrow hazard.

This soil is unsuited to building site development because of the occasional flooding.

The land capability classification is IIIw. The woodland ordination symbol is 7W.

42—Dameron silt loam. This very deep, nearly level, well drained soil is on small flood plains. It is frequently flooded. Individual areas are long and narrow and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface soil:
0 to 23 inches; very dark grayish brown, friable silt loam
23 to 32 inches; very dark grayish brown, friable silty clay loam

Substratum:
32 to 60 inches; very dark grayish brown, firm very gravelly silty clay loam

In some places the depth to a very gravelly layer is more than 40 inches.

Important soil properties—

Permeability: Moderate
Surface runoff: Slow
Available water capacity: Moderate
Organic matter content: High
Shrink-swell potential: Moderate

Most areas are used for hay, pasture, or woodland. This soil is suited to corn, soybeans, small grain, and grasses and legumes. Access is limited because the areas are small and commonly are bordered by soils that are less suited to cultivation. Flooding, ditchbank erosion, and runoff from the adjacent uplands are management concerns. Timely planting of short-season varieties helps to prevent damage from flooding during the growing season. Careful maintenance of permanent vegetation along stream channels helps to stabilize ditchbanks. Diversions help to control runoff from the adjacent uplands. Flood-control structures reduce flood damage and crop loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

This soil is well suited to switchgrass, alfalfa, ladino clover, red clover, orchardgrass, tall fescue, and timothy. It is moderately well suited to big bluestem and indiangrass. Grazing should be restricted to periods when flooding is not likely.

This soil is suited to trees. Numerous small areas support walnut and other native hardwoods. No major hazards or limitations affect planting or harvesting.

This soil is unsuited to building site development because of the frequent flooding.

The land capability classification is IIw. The woodland ordination symbol is 5A.

43—Nevin silt loam. This very deep, nearly level, somewhat poorly drained soil is on high stream flood plains. It is occasionally flooded. Individual areas are slightly elongated and range from about 10 to 80 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; very dark grayish brown, friable silt loam

Subsurface layer:
7 to 15 inches; very dark grayish brown, friable silt loam

Subsoil:
15 to 22 inches; dark grayish brown, mottled, friable silt loam
22 to 31 inches; dark grayish brown, mottled, firm silty clay loam
31 to 38 inches; grayish brown, mottled, firm silty clay loam
38 to 60 inches; gray, mottled, firm silty clay loam

In some areas the dark surface layer is less than 10 inches thick. In other areas the subsurface layer is dark grayish brown or grayish brown.

Important soil properties—

Permeability: Moderate
Surface runoff: Slow
Available water capacity: Very high
Organic matter content: High
Shrink-swell potential: Moderate
Depth to a seasonal high water table: 2 to 4 feet

Most areas are used for row crops. This soil is suited to corn, soybeans, small grain, and grasses and legumes for pasture and hay. Wetness and flooding are the main limitations affecting cultivated crops. The wetness is caused by runoff from adjacent hillsides. Diversions help to control runoff from the adjacent uplands. Levees or flood-control structures reduce flood damage and crop loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

The flooding and the wetness are concerns if this soil is used for hay or pasture. Pasture and hay species that tolerate wetness should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. The soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. Grazing should be restricted to periods when flooding is not likely.

This soil is unsuited to building site development because of the occasional flooding.

The land capability classification is IIw. No woodland ordination symbol is assigned.

46—Cotter silt loam. This very deep, nearly level, well drained soil is on high stream flood plains. It is

occasionally flooded. Individual areas are slightly elongated and range from about 10 to 40 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches; very dark grayish brown, friable silt loam

Subsurface layer:
8 to 18 inches; very dark grayish brown, mottled, friable silt loam

Subsoil:
18 to 23 inches; very dark grayish brown, mottled, firm silty clay loam
23 to 30 inches; dark brown, firm silt loam
30 to 37 inches; brown, firm silty clay loam
37 to 45 inches; brown, firm loam

Substratum:
45 to 60 inches; brown, firm loam

In many places the dark surface soil is less than 24 inches thick. In some places the subsoil is grayish brown or dark grayish brown throughout.

Important soil properties—

Permeability: Moderate
Surface runoff: Slow
Available water capacity: High
Organic matter content: High
Shrink-swell potential: Moderate

Most areas are used for row crops. This soil is suited to corn, soybeans, small grain, and grasses and legumes for pasture and hay. Flooding is the main limitation affecting cultivated crops. Levees or flood-control structures reduce flood damage and crop loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

The flooding also is a concern if this soil is used for hay or pasture. The soil is well suited to big bluestem, indiangrass, switchgrass, and most other warm-season grasses; to alfalfa, ladino clover, red clover, and most other legumes; and to orchardgrass, tall fescue, timothy, and most other cool-season grasses. Grazing should be restricted to periods when flooding is not likely.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is unsuited to building site development because of the occasional flooding.

The land capability classification is IIw. The woodland ordination symbol is 9A.

53B—Friendly silt loam, 1 to 3 percent slopes. This very deep, very gently sloping, somewhat poorly drained soil is on ridgetops in the uplands. Individual areas are irregular in shape and range from about 20 to more than 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches; very dark grayish brown, friable silt loam

Subsoil:
9 to 21 inches; dark grayish brown and brown, mottled, firm silty clay
21 to 29 inches; mottled light brownish gray and brownish yellow, very firm silt loam
29 to 36 inches; mottled light brownish gray and light yellowish brown, very firm extremely gravelly silt loam
36 to 60 inches; red, mottled, very firm clay and gravelly clay

In some places the upper part of the subsoil is silty clay loam.

Included with this soil in mapping are small areas of Hartwell soils. These soils do not have a dense layer in the subsoil. They are in the higher positions on the slope. They make up about 10 percent of the unit.

Important properties of the Friendly soil—

Permeability: Slow
Surface runoff: Slow
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 2 feet
Root-restricting feature: Dense, brittle layer at a depth of 29 inches

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas are too narrow to be managed independently, but they can be included

with adjacent soils in terrace systems and contour farming operations. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table and the low available water capacity resulting from the dense layer in the subsoil. This soil is moderately well suited to big bluestem, indiangrass, and birdsfoot trefoil. It is moderately suited to switchgrass, alfalfa, ladino clover, red fescue, and tall fescue. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. The equipment limitation is a management concern. Equipment should be used only when the soil is dry or frozen.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Excavation may be difficult because of the dense layer. Properly constructed sewage lagoons can function adequately on this soil. The slope is a moderate limitation. It can be overcome by grading the area.

Low strength, the shrink-swell potential, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIe. The woodland ordination symbol is 2W.

53B2—Friendly silt loam, 1 to 4 percent slopes, eroded. This very deep, very gently sloping and somewhat poorly drained soil is on side slopes and in concave areas at the upper part of drainageways in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 20 to more than 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches; very dark grayish brown, friable silt loam

Subsoil:
6 to 31 inches; brown, yellowish brown, and grayish brown, mottled, firm silty clay and silty clay loam
31 to 48 inches; yellowish brown and brown, mottled, very firm extremely gravelly silty clay loam
48 to 54 inches; strong brown, mottled, very firm extremely gravelly clay loam
54 to 60 inches; red, mottled, very firm clay

In some areas the surface layer is silty clay loam. In other areas the upper part of the subsoil is silty clay loam.

Included with this soil in mapping are small areas of Hartwell soils. These soils do not have a dense layer in the subsoil. They are in the higher positions on the slope. They make up about 5 percent of the unit.

Important properties of the Friendly soil—

Permeability: Slow
Surface runoff: Medium
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 2 feet
Root-restricting feature: Dense, brittle layer at a depth of 31 inches

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. The hazard of further erosion is severe if the soil is used for cultivated crops. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Terracing reduces the thickness of the material above the dense layer, resulting in channels that are low in fertility and

available water and that may be gravelly in places. Topsoil from adjacent areas can be added to the exposed channels after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table and the low available water capacity resulting from the dense layer in the subsoil. This soil is moderately well suited to big bluestem, indiangrass, birdsfoot trefoil, and reed canarygrass. It is moderately suited to switchgrass, alfalfa, ladino clover, red fescue, and tall fescue. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. The equipment limitation is a management concern. Equipment should be used only when the soil is dry or frozen.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Excavation may be difficult because of the dense layer. Properly constructed sewage lagoons can function adequately on this soil. The slope is a moderate limitation. It can be overcome by grading the area.

Low strength, the shrink-swell potential, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 2W.

54B—Paintbrush silt loam, 2 to 5 percent slopes. This very deep, gently sloping, moderately well drained soil is on ridgetops in the uplands. Individual areas are oblong and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches; very dark grayish brown, friable silt loam

Subsurface layer:
8 to 14 inches; brown, friable silt loam

Subsoil:
14 to 24 inches; brown, mottled, firm silty clay loam
24 to 37 inches; light brownish gray and strong brown, mottled, very firm extremely cobbly clay loam
37 to 60 inches; red, mottled, very firm gravelly silty clay

Included with this soil in mapping are small areas of the somewhat poorly drained Maplewood soils. These soils are in the upper parts of the unit. Also included are small areas of the well drained Eldon soils in saddles and in the lower positions on the slope. Included soils make up about 5 percent of the unit.

Important properties of the Paintbrush soil—

Permeability: Moderate above the dense layer, slow in the dense layer
Surface runoff: Medium
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate
Seasonal high water table: Perched at a depth of 1.5 to 3.0 feet
Root-restricting feature: Dense, brittle layer at a depth of 24 inches

Most areas are used for hay and pasture. Row crops are grown on a limited acreage. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas are too narrow to be managed independently, but they can be included with adjacent soils in terrace systems and contour farming operations. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly

adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table and the low available water capacity resulting from the dense layer in the subsoil. This soil is moderately well suited to big bluestem, indiangrass, lespedeza, orchardgrass, reed canarygrass, and tall fescue. It is moderately suited to switchgrass, ladino clover, and red clover. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. Windthrow is a management concern. Thinning the stands lightly but frequently reduces the hazard of windthrow.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Excavation may be difficult because of the dense layer and large stones. Properly constructed sewage lagoons can function adequately on this soil. Seepage and the slope are moderate limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

Wetness, the potential for frost action, and the large stones are moderate limitations on sites for local roads and streets. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by wetness and by frost action. Large stones should be removed when the subgrade is prepared.

The land capability classification is IIe. The woodland ordination symbol is 3D.

54B2—Paintbrush silt loam, 2 to 5 percent slopes, eroded. This very deep, gently sloping, moderately well drained soil is on side slopes in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 15 to more than 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 8 inches; very dark grayish brown, friable silt loam

Subsoil:

8 to 23 inches; brown and yellowish brown, mottled, firm silt loam

23 to 39 inches; multicolored, very firm extremely gravelly silt loam and extremely gravelly clay loam

39 to 44 inches; strong brown, mottled, very firm gravelly silty clay

44 to 60 inches; red, mottled, very firm clay

Included with this soil in mapping are small areas of the well drained Eldon soils. These soils are in the lower positions on the slope. Also included are small areas of the somewhat poorly drained Maplewood soils in concave areas on the upper parts of the slope. Included soils make up about 10 percent of the unit.

Important properties of the Paintbrush soil—

Permeability: Moderate above the dense layer, slow in the dense layer
Surface runoff: Medium
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate
Seasonal high water table: Perched at a depth of 1.5 to 3.0 feet
Root-restricting feature: Dense, brittle layer at a depth of 23 inches

Most areas are used for hay and pasture. Row crops are grown on a limited acreage. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. The hazard of further erosion is severe if the soil is used for cultivated crops. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Terracing reduces the thickness of the material above the dense layer, resulting in channels that are low in fertility and available water and that may be gravelly in places. Topsoil from adjacent areas can be added to the exposed channels after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is

effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table and the low available water capacity resulting from the dense layer in the subsoil. This soil is moderately well suited to big bluestem, indiangrass, lespedeza, orchardgrass, reed canarygrass, and tall fescue. It is moderately suited to switchgrass, ladino clover, and red clover. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. Windthrow is a management concern. Thinning the stands lightly but frequently reduces the hazard of windthrow.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Excavation may be difficult because of the dense layer and large stones. Properly constructed sewage lagoons can function adequately on this soil. Seepage and the slope are moderate limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

Wetness, the potential for frost action, and the large stones are moderate limitations on sites for local roads and streets. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by wetness and by frost action. Large stones should be removed when the subgrade is prepared.

The land capability classification is IIIe. The woodland ordination symbol is 3D.

54C—Paintbrush silt loam, 5 to 9 percent slopes. This very deep, moderately sloping, moderately well drained soil is on side slopes and narrow ridgetops in the uplands. Individual areas are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:

0 to 9 inches; very dark grayish brown, very friable silt loam

Subsoil:

9 to 21 inches; dark brown, friable silty clay loam and dark yellowish brown, mottled, firm silty clay loam

21 to 30 inches; grayish brown, mottled, very firm extremely cobbly silty clay loam

30 to 37 inches; brown, mottled, very firm extremely cobbly clay loam

37 to 43 inches; strong brown, mottled, very firm gravelly clay loam

43 to 52 inches; mottled red and strong brown, very firm clay

52 to 60 inches; strong brown, mottled, firm clay

Some areas are gently sloping.

Included with this soil in mapping are small areas of the well drained Eldon soils. These soils are in the lower positions on the slope. Also included are small areas of the somewhat poorly drained Maplewood soils in concave areas. Included soils make up about 15 percent of the unit.

Important properties of the Paintbrush soil—

Permeability: Moderate above the dense layer, slow in the dense layer
Surface runoff: Medium
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate
Seasonal high water table: Perched at a depth of 1.5 to 3.0 feet
Root-restricting feature: Dense, brittle layer at a depth of 21 inches

Most areas are used for hay and pasture. Row crops are grown on a limited acreage. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Terracing reduces the thickness of the material above the dense layer, resulting in channels that are low in fertility and available water and that may be gravelly in places. Topsoil from adjacent areas can be added to the exposed channels after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is

effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table and the low available water capacity resulting from the dense layer in the subsoil. This soil is moderately well suited to big bluestem, indiangrass, lespedeza, orchardgrass, reed canarygrass, and tall fescue. It is moderately suited to switchgrass, ladino clover, and red clover. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. Windthrow is a management concern. Thinning the stands lightly but frequently reduces the hazard of windthrow.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Excavation may be difficult because of the dense layer and large stones. Properly constructed sewage lagoons can function adequately on this soil. The slope and seepage are limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

Wetness, the potential for frost action, and the large stones are moderate limitations on sites for local roads and streets. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by wetness and by frost action. Large stones should be removed when the subgrade is prepared.

The land capability classification is IIIe. The woodland ordination symbol is 3D.

55B—Bahner silt loam, 2 to 5 percent slopes. This very deep, gently sloping, well drained soil is on ridgetops in the uplands. Individual areas are irregular in shape and range from about 10 to 50 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 5 inches; dark brown, friable silt loam

Subsurface layer:
5 to 9 inches; dark brown, friable silt loam

Subsoil:
9 to 27 inches; brown and strong brown, firm silty clay loam
27 to 50 inches; yellowish red and pale brown, mottled, very firm extremely gravelly clay loam
50 to 60 inches; red, mottled, very firm gravelly clay

In many areas the surface layer is dark grayish brown.

Included with this soil in mapping are small areas of the well drained Eldon soils. These soils are in the lower positions on the slope. They make up about 5 percent of the unit.

Important properties of the Bahner soil—

Permeability: Moderate above the dense layer, slow in the dense layer
Surface runoff: Medium
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate
Seasonal high water table: Perched at a depth of 3 to 4 feet
Root-restricting feature: Dense, brittle layer at a depth of 27 inches

Most areas are used for hay and pasture. Row crops are grown on a limited acreage. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas are too narrow to be managed independently, but they can be included with adjacent soils in terrace systems and contour farming operations. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the low available water capacity resulting from the dense layer in the subsoil. This soil is moderately well suited to big bluestem, indiangrass, lespedeza, orchardgrass, reed canarygrass, and tall fescue. It is moderately suited to switchgrass, ladino clover, and red clover. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. No major hazards or

limitations affect planting or harvesting.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Excavation may be difficult because of the dense layer. Properly constructed sewage lagoons can function adequately on this soil. Seepage and the slope are moderate limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

Low strength, the shrink-swell potential, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIe. The woodland ordination symbol is 3A.

55C—Bahner silt loam, 5 to 9 percent slopes. This very deep, moderately sloping, well drained soil is on side slopes and narrow ridgetops in the uplands. Individual areas are irregular in shape and range from about 10 to 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches; dark brown, friable silt loam

Subsurface layer:
6 to 11 inches; dark brown, firm silty clay loam

Subsoil:
11 to 32 inches; dark yellowish brown and dark brown, mottled, firm silty clay loam
32 to 44 inches; yellowish red, mottled, very firm very gravelly silty clay loam
44 to 60 inches; strong brown, very firm extremely gravelly clay loam

In many places the surface layer is dark grayish brown.

Included with this soil in mapping are small areas of the well drained Eldon soils. These soils are in the lower positions on the slope. They make up about 5 percent of the unit.

Important properties of the Bahner soil—

Permeability: Moderate above the dense layer, slow in the dense layer
Surface runoff: Medium
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate
Seasonal high water table: Perched at a depth of 3 to 4 feet
Root-restricting feature: Dense, brittle layer at a depth of 32 inches

Most areas are used for hay and pasture. Row crops are grown on a limited acreage. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Terracing reduces the thickness of the material above the dense layer, resulting in channels that are low in fertility and available water and that may be gravelly in places. Topsoil from adjacent areas can be added to the exposed channels after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the low available water capacity resulting from the dense layer in the subsoil. This soil is moderately well suited to big bluestem, indiangrass, lespedeza, orchardgrass, and tall fescue. It is moderately suited to switchgrass, ladino clover, and red clover. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Excavation may be difficult because of the dense layer. Properly constructed sewage lagoons can function adequately on this soil. The slope and seepage are limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

Low strength, the shrink-swell potential, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

58B2—Sedalia silty clay loam, 2 to 5 percent slopes, eroded. This very deep, gently sloping, somewhat poorly drained soil is on concave side slopes in the uplands. Erosion has removed some of the original surface layer. The rest of this layer has been mixed with subsoil material by tillage. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 5 to 40 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
- 0 to 7 inches; very dark grayish brown, friable silty clay loam

Subsoil:
- 7 to 18 inches; dark grayish brown, mottled, firm silty clay
- 18 to 34 inches; grayish brown and pale brown, mottled, firm silty clay loam
- 34 to 60 inches; yellowish brown, firm extremely cobbly clay loam and clay

In some areas the surface layer is silt loam. In other areas the subsoil does not contain cobbles or gravel.

Important soil properties—

Permeability: Slow
Surface runoff: Medium
Available water capacity: Moderate
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1.5 to 3.0 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. The hazard of further erosion is severe if the soil is used for cultivated crops. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Channels may also be cobbly in places where cuts are made in the extremely cobbly part of the subsoil. Topsoil from adjacent areas can be added to the exposed channels after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a moderate limitation. It can be overcome by grading the area.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to

prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

58C2—Sedalia silt loam, 5 to 9 percent slopes, eroded. This very deep, moderately sloping, somewhat poorly drained soil is on concave side slopes in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 10 to 60 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; dark brown, friable silt loam

Subsoil:
7 to 24 inches; yellowish brown and brown, mottled, firm silty clay loam and silty clay
24 to 37 inches; yellowish brown and dark yellowish brown, mottled, firm gravelly silty clay loam and extremely gravelly clay loam
37 to 60 inches; very pale brown, light gray, and yellow, mottled, very firm clay

In some areas the surface layer is silty clay loam. In other areas the subsoil does not contain gravel.

Important soil properties—

Permeability: Slow
Surface runoff: Medium
Available water capacity: Moderate
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1.5 to 3.0 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. The hazard of further erosion is severe if the soil is used for cultivated crops. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. The clayey subsoil exposed by terracing cannot be easily tilled, is low in fertility and available water, and may require special management practices. Channels may also be gravelly in places where cuts are made in the extremely gravelly part of the subsoil. Topsoil from adjacent areas can be added to the exposed channels after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table. This soil is well suited to ladino clover. It is moderately well suited to big bluestem, indiangrass, switchgrass, alsike clover, tall fescue, and timothy. It is moderately suited to red clover and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope is a severe limitation. It can be overcome by grading the area.

The shrink-swell potential, low strength, wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

62B2—Maplewood silt loam, 2 to 5 percent slopes, eroded. This very deep, gently sloping, somewhat poorly drained soil is on concave side slopes in the uplands. Erosion has removed some of the original surface layer. Rills are common in cultivated areas after intense rains. Individual areas of this soil are irregular in shape and range from about 15 to more than 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 6 inches; dark brown, friable silt loam

Subsoil:
6 to 17 inches; brown, mottled, firm silty clay loam and silty clay
17 to 32 inches; brown, mottled, very firm silty clay loam
32 to 60 inches; multicolored, firm very cobbly silty clay, very cobbly clay, and clay

In places the surface layer is silty clay loam. In some areas the upper part of the subsoil is silty clay. In other areas the subsoil does not contain cobbles or gravel.

Included with this soil in mapping are small areas of the well drained Eldon soils. These soils are in the lower positions on the slope. They make up about 5 percent of the unit.

Important properties of the Maplewood soil—

Permeability: Slow
Surface runoff: Medium
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: High
Seasonal high water table: Perched at a depth of 1 to 2 feet
Root-restricting feature: Dense, brittle layer at a depth of 17 inches

Most areas are used for hay and pasture. Row crops are grown on a limited acreage. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. The hazard of further erosion is severe if the soil is used for cultivated crops. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Terracing reduces the thickness of the material above the dense layer, resulting in channels that are low in fertility and available water capacity and that may be cobbly in places. Topsoil from adjacent areas can be added to the exposed channels after construction. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the seasonal high water table and the low available water capacity resulting from the dense layer in the subsoil. This soil is moderately well suited to big bluestem, indiangrass, birdsfoot trefoil, and reed canarygrass. It is moderately suited to switchgrass, alfalfa, ladino clover, red fescue, and tall fescue. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to trees. The equipment limitation is a management concern. Equipment should be used only when the soil is dry or frozen.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Excavation may be difficult because of the dense layer. Properly constructed sewage lagoons can function adequately on this soil. The slope and wetness are limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

Low strength, the shrink-swell potential, the wetness, and the potential for frost action are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling, wetness, and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3W.

75C—Barco loam, 5 to 9 percent slopes. This moderately deep, moderately sloping, well drained soil is on side slopes and narrow ridgetops in the uplands. Individual areas are irregular in shape and range from about 5 to 20 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface soil:
0 to 9 inches; dark brown, friable loam

Subsoil:
9 to 27 inches; dark yellowish brown, firm clay loam

Bedrock:
27 to 45 inches; soft, weathered sandstone

45 inches; hard sandstone

In some places the surface layer is silt loam. In other places the depth to sandstone is more than 40 inches. Some areas are strongly sloping.

Included with this soil in mapping are small areas of the somewhat poorly drained Greenton soils. These soils occur throughout the unit. They make up about 5 percent of the unit.

Important properties of the Barco soil—

Permeability: Moderate
Surface runoff: Medium
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate

Most areas are used for hay or pasture. A few areas are used as woodland. This soil is suited to hay and pasture. It is suited to row crops only on a limited basis. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Terraces are generally impractical because of the moderate depth to sandstone. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the moderate depth to bedrock. This soil is moderately well suited to big bluestem, indiangrass, lespedeza, orchardgrass, reed canarygrass, and tall fescue. It is moderately suited to switchgrass, ladino clover, and red clover. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Excavation may be difficult because of the moderate depth to sandstone. Properly constructed sewage lagoons can function adequately on this soil. The slope and seepage are severe limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

The shrink-swell potential and low strength are moderate limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

75D—Barco loam, 9 to 14 percent slopes. This moderately deep, strongly sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from about 10 to more than 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches; dark brown, friable loam

Subsoil:
8 to 26 inches; dark yellowish brown, strong brown, and yellowish brown, mottled, firm clay loam

Bedrock:
26 to 45 inches; soft, weathered sandstone
45 inches; hard sandstone

In places the surface layer is silt loam. In some areas the depth to sandstone is more than 40 inches. In other areas the soil is moderately steep and has more rock fragments throughout.

Included with this soil in mapping are small areas of the somewhat poorly drained Greenton soils. These soils occur throughout the unit. They make up about 5 percent of the unit.

Important properties of the Barco soil—

Permeability: Moderate
Surface runoff: Rapid
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate
Root-restricting feature: Soft sandstone at a depth of 26 inches

Most areas are used for hay and pasture. A few areas are used as woodland. This soil is suited to hay

and pasture. It is suited to row crops only on a limited basis. Insufficient soil moisture is a problem affecting cultivated crops in the summer because of the restricted rooting depth. Early planting of short-season varieties reduces damage to corn. Grain sorghum and winter wheat are inherently more tolerant of droughty conditions than corn. The hazard of erosion is severe if the soil is used for cultivated crops. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Terraces generally are impractical because of the moderate depth to sandstone. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the moderate depth to bedrock. This soil is moderately well suited to big bluestem, indiangrass, lespedeza, reed canarygrass, and tall fescue. It is moderately suited to switchgrass and orchardgrass. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Excavation may be difficult because of the moderate depth to sandstone. Land shaping can modify the slope, or the dwellings can be designed so that they conform to the natural slope of the land. Properly constructed sewage lagoons can function adequately on this soil. Seepage and the slope are severe limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

The shrink-swell potential, low strength, and the slope are moderate limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Some cutting and filling may be necessary because of the slope, or roads can be designed so that they conform to the natural slope of the land. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IVe. No woodland ordination symbol is assigned.

75F—Barco loam, 14 to 35 percent slopes, very stony. This moderately deep, moderately steep and steep, well drained soil is on side slopes in the uplands. Sandstone fragments 10 inches or more in size cover 0.1 to 3.0 percent of the surface. Individual areas of this soil are irregular in shape and range from about 10 to more than 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 9 inches; very dark grayish brown, friable loam

Subsoil:
9 to 15 inches; dark brown, friable loam
15 to 20 inches; dark brown, firm clay loam
20 to 26 inches; brown, mottled, firm clay loam

Bedrock:
26 to 45 inches; soft, partially weathered sandstone
45 inches; hard sandstone

In places the depth to soft sandstone is more than 40 inches. Some areas are strongly sloping.

Important soil properties—

Permeability: Moderate
Surface runoff: Rapid
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate
Root-restricting feature: Soft sandstone at a depth of 26 inches

Most areas are used as woodland. This soil has limited suitability for pasture.

This soil is suited to trees. The hazard of erosion, the equipment limitation, and seedling mortality are management concerns. Establishing roads and skid trails on the contour helps to overcome the steepness and length of slopes and minimizes the concentration of water. Seeding of disturbed areas may be necessary after harvesting is completed. Because of limestone fragments in the surface layer, it may be necessary to plant seedlings by hand or by direct seeding. Planting container-grown nursery stock or reinforcement planting improves the seedling survival rate. Proper selection of tree species for planting is essential. Only a few species can tolerate the severe conditions in areas of this soil.

Growing grasses and legumes for pasture is effective

in controlling erosion. Pasture species that tolerate drought should be selected for planting. Deep-rooted legumes, such as alfalfa, do not grow well because of the moderate depth to bedrock. This soil is moderately well suited to big bluestem, indiangrass, lespedeza, and tall fescue. It is moderately suited to switchgrass and orchardgrass. When new seedlings are established, broadcast seeding may be necessary because of the slope and the large stones on the surface. This soil generally is not used as hayland because of the large stones and the slope.

This soil is suited to building site development if proper design and installation procedures are used. Land shaping can modify the slope, or the buildings can be designed so that they conform to the natural slope of the land. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Excavation may be difficult because of the moderate depth to sandstone. Large stones can be removed from the building site or rearranged for landscaping purposes. This soil generally is not used for onsite waste disposal systems because of the slope and the depth to sandstone. Sewage can be piped to adjacent areas that are more suitable for lagoons or septic tank absorption fields.

The slope, the shrink-swell potential, and low strength are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Some cutting and filling may be necessary because of the slope, or roads can be designed so that they conform to the natural slope of the land. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is VIe. The woodland ordination symbol is 3R.

77B—Wakenda silt loam, 2 to 5 percent slopes. This very deep, gently sloping, moderately well drained soil is on ridgetops in the uplands. Individual areas are oblong and range from about 5 to 60 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; very dark grayish brown, friable silt loam

Subsurface layer:
7 to 11 inches; dark brown, friable silt loam

Subsoil:
11 to 27 inches; dark brown, firm silty clay loam
27 to 60 inches; dark yellowish brown, firm silty clay loam

In some places the dark surface layer is less than 10 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Macksburg soils in the upper parts of the unit. These soils make up about 5 percent of the unit.

Important properties of the Wakenda soil—

Permeability: Moderate
Surface runoff: Medium
Available water capacity: High
Organic matter content: High
Shrink-swell potential: Moderate
Seasonal high water table: Perched at a depth of 4 to 6 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper crop rotations. Erosion is a hazard if cultivated crops are grown. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Most areas are too narrow to be managed independently, but they can be included with adjacent soils in terrace systems and contour farming operations. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. This soil is well suited to big bluestem, indiangrass, switchgrass, and most other warm-season grasses; to alfalfa, ladino clover, red clover, and most other legumes; and to orchardgrass, tall fescue, timothy, and most other cool-season grasses. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the

damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. Wetness, seepage, and the slope are moderate limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

Low strength, the potential for frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IIe. No woodland ordination symbol is assigned.

77C—Wakenda silt loam, 5 to 9 percent slopes. This very deep, moderately sloping, moderately well drained soil is on side slopes in the uplands. Individual areas are oblong and range from about 5 to 60 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 12 inches; very dark grayish brown, friable silt loam

Subsurface layer:
12 to 18 inches; dark brown, friable silty clay loam

Subsoil:
18 to 24 inches; dark yellowish brown, firm silty clay loam
24 to 34 inches; brown, mottled, firm silty clay loam
34 to 60 inches; light olive brown and yellowish brown, mottled, firm silty clay loam

In many places the dark surface layer is less than 10 inches thick. In some areas the surface layer is silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Arispe soils in concave areas. These soils make up about 5 percent of the unit.

Important properties of the Wakenda soil—

Permeability: Moderate
Surface runoff: Medium
Available water capacity: High
Organic matter content: High
Shrink-swell potential: Moderate
Seasonal high water table: Perched at a depth of 4 to 6 feet

Most areas are used for row crops, hay, or pasture. This soil is suited to corn, soybeans, small grain, and grasses and legumes in proper rotations. The hazard of erosion is severe if the soil is used for cultivated crops. A combination of conservation practices helps to prevent excessive soil loss. A system of conservation tillage, such as no-till farming, that leaves a protective cover of crop residue on the surface helps to control erosion. Many areas have smooth slopes and are large enough to be terraced and farmed on the contour. Contour stripcropping alternates strips of permanent grasses or legumes with strips of row crops planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. This soil is well suited to big bluestem, indiangrass, switchgrass, and most other warm-season grasses; to alfalfa, ladino clover, red clover, and most other legumes; and to orchardgrass, tall fescue, timothy, and most other cool-season grasses. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation practices are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. Properly constructed sewage lagoons can function adequately. The slope, wetness, and seepage are limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

Low strength, the potential for frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Strengthening the subgrade with crushed rock or other suitable material helps to prevent the damage caused by low strength. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IIIe. No woodland ordination symbol is assigned.

81C—Eldon gravelly silt loam, 3 to 9 percent slopes. This very deep, gently sloping and moderately sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from about 5 to more than 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 7 inches; very dark brown, friable gravelly silt loam

Subsoil:
7 to 14 inches; dark brown, firm very gravelly silty clay loam
14 to 22 inches; yellowish red, firm very gravelly silty clay loam
22 to 28 inches; red, firm very gravelly clay
28 to 60 inches; multicolored, firm gravelly clay and clay

In some areas the subsoil has grayish colors throughout. In other areas the surface layer is gravelly silty clay loam, very gravelly silty clay loam, or very gravelly silt loam. In places the subsoil has less than 35 percent coarse fragments throughout. Some areas are strongly sloping.

Included with this soil in mapping are small areas of the moderately well drained Paintbrush soils. These soils are in the higher positions on the slope. They make up about 5 percent of the unit.

Important properties of the Eldon soil—

Permeability: Moderate
Surface runoff: Medium
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate

Most areas are used for hay and pasture. A few areas are used as woodland. This soil is suited to hay and pasture. It is generally not suited to row crops because of the rock fragments in the surface layer.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that are drought resistant should be selected for planting because of the low available water capacity. This soil is moderately well suited to big bluestem, indiangrass, switchgrass, alfalfa, orchardgrass, and tall fescue. It is moderately suited to ladino clover, red clover, and timothy. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Because of the moderate permeability in the subsoil, septic tank absorption fields generally do not function adequately unless the size of the absorption field is increased. Properly constructed sewage lagoons can be used. Seepage and the slope are moderate limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

The shrink-swell potential and the potential for frost action are moderate limitations on sites for local roads and streets. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by shrinking and swelling and by frost action.

The land capability classification is IVe. No woodland ordination symbol is assigned.

81D—Eldon gravelly silt loam, 9 to 14 percent slopes. This very deep, strongly sloping, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and range from about 5 to more than 100 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 8 inches; dark brown, friable gravelly silt loam

Subsoil:
8 to 14 inches; reddish brown, firm very gravelly silty clay
14 to 40 inches; reddish brown and yellowish red, firm very gravelly clay
40 to 48 inches; reddish brown, mottled, firm very gravelly clay
48 to 60 inches; red, firm clay

In places the subsoil has grayish colors throughout. In some areas the surface layer is gravelly silty clay loam, very gravelly silty clay loam, or very gravelly silt loam. In other areas the subsoil has less than 35 percent coarse fragments throughout. In some places the dark surface layer is less than 5 inches thick.

Important soil properties—

Permeability: Moderate
Surface runoff: Rapid
Available water capacity: Low
Organic matter content: Moderate
Shrink-swell potential: Moderate

Most areas are used for hay and pasture. A few areas are used as woodland. This soil is suited to hay and pasture. It is generally not suited to cultivated crops because of the rock fragments in the surface layer.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Pasture and hay species that tolerate drought should be selected for planting because of the low available water capacity. This soil is moderately well suited to big bluestem, indiangrass, switchgrass, and tall fescue. It is moderately suited to alfalfa, ladino clover, red clover, orchardgrass, and

timothy. When new seedlings are established, tilling on the contour, planting nurse crops, or leaving crop residue on the surface helps to prevent excessive erosion.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Land shaping can modify the slope, or the dwellings can be designed so that they conform to the natural slope of the land. The design of septic tank absorption fields should compensate for the slope and the moderate permeability. The lateral lines can be extended and designed across the slope. Properly constructed sewage lagoons can function adequately. The slope and seepage are limitations. They can be overcome by grading the area and by sealing the bottom of the lagoon.

The shrink-swell potential, the slope, and the potential for frost action are moderate limitations on sites for local roads and streets. Some cutting and filling may be necessary because of the slope, or the roads may be designed so that they conform to the natural slope of the land. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by frost action and by shrinking and swelling.

The land capability classification is VIe. No woodland ordination symbol is assigned.

83D—Moko very channery silt loam, 5 to 14 percent slopes. This shallow, moderately sloping and strongly sloping, well drained soil is on side slopes and ridgetops in the uplands. Individual areas are irregular in shape and range from about 10 to 40 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface soil:
0 to 7 inches; very dark grayish brown, friable very channery and extremely channery silt loam

Substratum:
7 to 10 inches; dark grayish brown, friable extremely channery silt loam

Bedrock:
10 inches; limestone

Included with this soil in mapping are areas of rock outcrop. Also included are areas that are more than 20 inches deep over bedrock. These included areas occur throughout the unit. They make up about 15 percent of the unit.

Important properties of the Moko soil—

Permeability: Moderate
Surface runoff: Rapid
Available water capacity: Very low
Organic matter content: Moderate
Shrink-swell potential: Low
Root-restricting feature: Limestone at a depth of 10 inches

Most areas are used for pasture or woodland. Because of the very low available water capacity, this soil is unsuited to all pasture species that are not tolerant of drought. It is only poorly suited to species that are drought tolerant, such as big bluestem, indiangrass, little bluestem, timothy, tall fescue, lespedeza, and alsike clover. When new seedlings are established, broadcast seeding may be necessary because of rock fragments in the surface layer and the shallow depth to bedrock.

This soil is suited to trees. The hazard of erosion, the equipment limitation, seedling mortality, and windthrow are management concerns. Establishing roads and skid trails on the contour helps to overcome the steepness and length of slopes and minimizes the concentration of water. Seeding of disturbed areas may be necessary after harvesting is completed. Thinning the stands lightly but frequently reduces the hazard of windthrow. Because of the rock fragments in the surface layer, it may be necessary to plant seedlings by hand or by direct seeding. Planting container-grown nursery stock or reinforcement planting improves the seedling survival rate. Proper selection of tree species for planting is essential. Only a few species can tolerate the severe conditions in areas of this soil.

This soil generally is not used for building site development, sanitary facilities, or local roads and streets because of the depth to bedrock.

The land capability classification is VIs. The woodland ordination symbol is 2X.

83F—Moko very channery loam, 14 to 50 percent slopes. This shallow, moderately steep to very steep, well drained soil is on side slopes in the uplands. Individual areas are long and irregularly shaped and range from about 10 to 80 acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface soil:
0 to 4 inches; very dark grayish brown, friable very channery loam

4 to 7 inches; very dark grayish brown, friable very channery clay loam

Bedrock:
7 inches; limestone

Included with this soil in mapping are areas of rock outcrop. These areas occur throughout the unit. Also included are areas of the very deep, well drained Goss soils, typically in the lower positions on the slope. Included areas make up about 15 percent of the unit.

Important properties of the Moko soil—

Permeability: Moderate
Surface runoff: Rapid
Available water capacity: Very low
Organic matter content: Moderate
Shrink-swell potential: Low
Root-restricting feature: Limestone at a depth of 7 inches

Most areas are used as woodland. This soil is best suited to trees. The hazard of erosion, the equipment limitation, seedling mortality, and windthrow are management concerns. Establishing roads and skid trails on the contour helps to overcome the steepness and length of slopes and minimizes the concentration of water. Seeding of disturbed areas may be necessary after harvesting is completed. In severe cases it may be necessary to yard logs uphill to logging roads or skid trails. Thinning the stands lightly but frequently reduces the hazard of windthrow. Because of the rock fragments in the surface layer, it may be necessary to plant seedlings by hand or by direct seeding. Planting container-grown nursery stock or reinforcement planting improves the seedling survival rate. Proper selection of tree species for planting is critical. Only a few species can tolerate the severe conditions in areas of this soil.

This soil generally is not used for building site development, sanitary facilities, or local roads and streets because of the depth to bedrock and the slope.

The land capability classification is VIIs. The woodland ordination symbol is 2R.

85F—Goss very cobbly silt loam, 14 to 35 percent slopes. This very deep, moderately steep and steep, well drained soil is on side slopes in the uplands. Individual areas are long and irregularly shaped and range from about 10 to several hundred acres in size.

The typical sequence, depth, and composition of the layers of this soil are as follows—

Surface layer:
0 to 3 inches; very dark grayish brown, friable very cobbly silt loam

Subsurface layer:
3 to 15 inches; brown and pale brown, friable very cobbly silt loam

Subsoil:
15 to 22 inches; yellowish brown, firm very cobbly silt loam
22 to 40 inches; yellowish red, mottled, firm very cobbly clay
40 to 55 inches; brownish yellow, mottled, very firm very cobbly clay

Substratum:
55 to 60 inches; strong brown and yellowish brown, very firm very cobbly clay

Some areas are strongly sloping. In places the dark surface layer is more than 5 inches thick. In some areas the subsoil has gray colors throughout.

Included with this soil in mapping are areas of Moko soils. These soils are shallow over bedrock. Also included are areas that have bedrock within a depth of 20 to 40 inches. These included areas occur throughout the unit. They make up about 10 percent of the unit.

Important properties of the Goss soil—

Permeability: Moderate
Surface runoff: Rapid
Available water capacity: Low
Organic matter content: Low
Shrink-swell potential: Moderate

Most areas are used as woodland. This soil is best suited to trees. The hazard of erosion and the equipment limitation are management concerns. Establishing roads and skid trails on the contour helps to overcome the steepness and length of slopes and minimizes the concentration of water. Seeding of disturbed areas may be necessary after harvesting is completed. In severe cases it may be necessary to yard logs uphill to logging roads or skid trails. Because of chert fragments in the surface layer, it may be necessary to plant seedlings by hand or by direct seeding.

This soil is suited to building site development and onsite waste disposal systems if proper design and installation procedures are used. Land shaping can modify the slope, or the buildings can be designed so that they conform to the natural slope of the land. Constructing foundations, footings, and basement walls with adequately reinforced concrete helps to prevent the structural damage caused by shrinking and swelling. Large stones can be removed from the building site or rearranged for landscaping purposes. The design of septic tank absorption fields should compensate for the

slope, the moderate permeability, and the large stones. The lateral lines can be extended and designed across the slope, or sewage can be piped to adjacent areas that are more suitable for lagoons or septic tank absorption fields.

The slope, the shrink-swell potential, and the potential for frost action are limitations on sites for local roads and streets. Some cutting and filling may be necessary because of the slope, or the roads can be designed so that they conform to the natural slope of the land. Constructing roadside ditches and installing culverts for drainage can minimize the damage caused by frost action and by shrinking and swelling.

The land capability classification is VIIe. The woodland ordination symbol is 3R.

99—Pits, quarries. This map unit consists of open excavations from which soil material has been removed during mining of the underlying limestone or dolomite.

Typically, a quarry has a vertical exposure on two or three sides. These exposures range from 10 to more than 50 feet in height and are made up of the limestone being quarried and the overlying formations that were removed to gain access to it. Above this vertical rock face are layers of clayey residuum 4 to 10 feet thick.

The active pit areas make up about 30 percent of this unit. About 30 percent consists of rubble and spoil piles, and 30 percent consists of packed roadways and stockpiles of gravel and lime. Some pits are being used for landfill. Overburden from the active quarry area is spread over compacted layers of refuse to seal them. Areas of rubble and spoil are rough and steep. In some areas, drainage outlets are not available and the pits are filled with water (fig. 7).

Included in mapping are small areas of loess 3 to 6 feet thick over residuum. Also included are areas of overburden that has been removed and stockpiled in adjoining undisturbed areas or placed in previously mined pits. Included areas make up about 10 percent of the unit.

Some areas of this unit are sparsely covered by weeds, brush, and fast-growing hardwoods, such as cottonwood and elm. Some inactive quarries can be reclaimed for wildlife habitat or for recreational uses. Some fringe areas can be used for dwellings.

No land capability classification or woodland ordination symbol is assigned.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 300,000 acres in the survey area, or nearly 68 percent of the total acreage, meets the soil requirements for prime farmland. Most of the prime farmland is in the western part of the county, mainly in associations 3 and 6, which are described under the heading "General Soil Map Units." In 1987, approximately 267,600 acres in Pettis County was used for crops *(13)*. Most of this acreage is prime farmland.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify as prime farmland only in areas

Figure 7.—An inactive pit that has been filled with water and is used for recreational purposes.

where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1987, approximately 267,600 acres in Pettis County, or about 61 percent of the land area, was used for crops *(13)*. Approximately 50,515 acres was woodland, and about 54,300 acres was used as pasture. About 66,900 acres was urban or residential land, small private acreages, roads, railroads, or government property. About 68 percent of the county, or about 300,000 acres, is prime farmland. About 75 percent of the prime farmland is used for crops.

Corn, soybeans, grain sorghum, and winter wheat are the most commonly grown field crops and are best suited to the soils and climate of the county. Soybeans are grown on about 79,139 acres, corn is grown on 30,640 acres, and grain sorghum is grown on 19,705 acres. Winter wheat, which is the most common close-growing crop in the survey area, is grown on about 7,057 acres. About 39,000 acres is used as hayland, and 93,778 acres of potential cropland is grazed, unharvested, or idle land. Oats and rye are grown on a limited acreage, and indiangrass, switchgrass, big bluestem, fescue, timothy, orchardgrass, and other grasses are harvested for seed.

Only about 38 percent of the cropland and hayland in Pettis County is adequately treated to meet conservation needs *(9)*. The cropland that is not adequately treated is mostly in upland areas that are being farmed in a manner that results in an erosion rate that exceeds a tolerable limit for sustained production over a long period of time. Some of the marginal cropland used for row crops should be converted to pasture or hayland. Soil loss on most of the cropland can be held to a tolerable amount, generally 2 to 5 tons per acre per year, by using a system of conservation

practices designed for specific sites. Some fields on which no conservation practices are applied lose more than 40 tons of soil per acre per year.

Erosion is the major problem on nearly all of the sloping cropland and overgrazed pastureland in Pettis County. All soils that have slopes of more than 2 percent and some fragile soils that have long slopes of less than 2 percent are susceptible to erosion.

Loss of the surface layer through erosion is damaging for several reasons. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as Arispe and Hartwell soils. Erosion also reduces the productivity of soils that are droughty and removes valuable nutrients from the topsoil. Erosion on farmland results in the sedimentation of streams, lakes, and ponds. Erosion control minimizes this pollution and improves the quality of water for municipal and recreational uses and for fish and wildlife. Erosion control also prolongs the useful life of ponds, lakes, drainage canals, and roadside ditches by preventing them from filling up with sediment.

Erosion-control practices protect the surface layer, help to control runoff, and increase the rate of water infiltration. A cropping system that keeps vegetation or crop residue on the surface helps to control erosion and preserves the productive capacity of the soil. Growing grasses and legumes for pasture and hay helps to control erosion. Including legumes, such as clover and alfalfa, in the cropping sequence improves tilth and provides nitrogen for the subsequent crop.

Significant reductions in soil loss can be accomplished by applying basic management techniques. Farming on the contour reduces soil loss by as much as 50 percent. Conservation tillage is a system in which the amount of tillage is reduced or changed so that at least 30 percent of the surface is covered with crop residue after the crop is planted. The crop residue reduces the impact of raindrops, which can dislodge unprotected topsoil. Also, the runoff rate is reduced so that soil particles are less likely to be removed from the field. The effectiveness of such a tillage system increases as increasing amounts of residue are left on the surface. A system of conservation tillage can be applied on all of the upland soils that are commonly used for row crops. No-till farming, an important system of conservation tillage used in the survey area, eliminates tillage operations entirely and leaves nearly all of the crop residue on the surface. No-till farming also reduces equipment and fuel costs, minimizes soil compaction, conserves soil moisture, and reduces the time required for planting.

The large amounts of residue left by no-till farming also shield the soil from sunshine and thus reduce the evaporation rate. The reduced evaporation rate is an asset in the summer during droughty periods but tends to delay warming and drying of the soil in the spring. For this reason no-till farming is best suited to very deep, moderately well drained or well drained soils, such as Bluelick, Cotter, Pembroke, and Wakenda soils. Including small grain and grasses and legumes in the crop rotation also reduces soil loss.

Contour stripcropping is another important erosion-control practice. It involves the maintenance of contoured strips of permanent vegetation, generally grasses or legumes, which are used for hay. The areas between the strips are cultivated, and row crops are planted on the contour. The grass-legume strips minimize erosion and reduce the runoff rate.

Terraces reduce the length of slopes and thus help to control runoff and erosion. Conventional terraces are practical on the uneroded upland soils that have long, smooth slopes of less than 8 percent. Special construction and management techniques are necessary in most areas of the strongly sloping Bluelick and Pembroke soils. The construction of grassed backslope or narrow-base terraces reduces the steepness of the slope because construction cuts are made from the downslope side. The construction of conventional terraces, however, actually increases the slope and makes further erosion-control measures crucial. On many soils, such as Arispe and Hartwell soils, special management techniques may be required in areas where terracing exposes the clayey subsoil. Soils that have a dense layer in the subsoil have similar intensive management needs. These include Bahner, Friendly, Maplewood, and Paintbrush soils.

Grade-stabilization structures are small water bodies that cover gullied areas and prevent further uphill encroachment. These structures provide a stable place into which runoff from terraced fields can be emptied through tile outlets or grassed waterways.

All of the eroded upland soils have a higher content of clay in the surface layer than the corresponding uneroded soils. As a result, tilth is poorer, the infiltration rate is slower, and the runoff rate is more rapid. Conservation practices are needed to control further erosion.

Fall tillage is used to some extent in Pettis County, but it is a poor practice on most of the soils in the uplands. These soils generally are sloping and are subject to erosion if they are plowed in the fall.

In 1987, about 13,500 acres of cropland in the county was idle as a result of the Conservation Reserve Program, which is part of the Food Security Act of 1985. This program and other similar programs have significantly reduced soil losses in the survey area.

Soil drainage and flood control are management concerns on about 27 percent of the acreage used for crops and pasture in the survey area. Arbela, Tanglenook, Lamine, Haig, Hartwell, and Zook soils are naturally so wet that planting or harvesting is delayed or crop production is reduced in most years. Land grading or surface drainage may be needed in areas of these soils. Flooding can be a problem on Arbela, Cotter, Dameron, Dockery, Lamine, Nevin, Otter, Tanglenook, and Zook soils. If flooding occurs, it is commonly during the period from late fall through late spring or early summer.

Soil fertility is naturally low in most of the eroded soils in the survey area, but all of the soils require additional plant nutrients for maximum production. Most of the soils are naturally acid in the upper part of the root zone and require applications of agricultural lime to raise the pH and the calcium level sufficiently for optimum growth of legumes. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the production level desired. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor affecting the germination of seeds and the infiltration of water. Soils that have good tilth are granular and porous. Most of the uneroded upland soils that are used for crops have a dark surface layer of silt loam or silty clay loam that has a moderate or high content of organic matter. Generally, tillage and compaction weaken the structure of soils that have a surface layer of silt loam. Periods of intense rainfall result in the formation of a crust on the surface. The crust is hard when dry, and it reduces the rate of water infiltration and increases the runoff rate. Regularly adding crop residue, manure, and other organic material improves soil structure and tilth.

A combination of different kinds of grasses and legumes is necessary to obtain maximum forage production in Pettis County. Cool temperatures in the spring and fall are favorable for the production of cool-season grasses. The hot summer months are more favorable for the production of warm-season grasses. Most of the soils in the survey area are suited to both kinds of grasses, and some of the soils are suited to legumes. A management system that includes cool-season grasses, warm-season grasses, and legumes results in the use of the entire growing season for forage production.

The cool-season grasses most commonly grown in the survey area are tall fescue, orchardgrass, timothy, smooth bromegrass, reed canarygrass, and Kentucky bluegrass. Reed canarygrass is generally planted in areas of the wetter bottom-land soils, but the rest of these grasses are most commonly grown in the uplands. These cool-season grasses can provide top production only when properly managed. Rotation grazing helps to keep the plants at an optimum height. Supplemental applications of fertilizer and timely weed control also are essential.

Cool-season grasses grow vigorously when temperatures are between 50 and 85 degrees F. These grasses generally start growing in late March and can be grazed by late April. Timothy and bromegrass will not produce tillers unless a seedhead is allowed to develop. Therefore, overgrazing or haying too early in the growing season reduces the total production of these species. Orchardgrass will regrow vigorously with or without development of a seedhead, so the timing of grazing or haying is less critical. Bluegrass is generally less productive than the other cool-season grasses, but it can better withstand overgrazing and poor management. Fescue can also withstand poor management, but fescue-foot, which is a disorder in cattle caused by a nutritional imbalance, and poor palatability can be problems. Stands free of endophyte are necessary for optimum herd nutrition. Reed canarygrass is moderately palatable and is highly productive in areas that are too wet for other grasses or for row crops. Because of increasing temperatures and amount of daylight, the production of cool-season grasses decreases significantly by mid-June. The cooler temperatures and shorter days of fall result in an increase in the growth of these grasses. Production continues until the first killing frost, usually in late October. An exception to this growth pattern is tall fescue, which continues to grow until sometime in December.

Warm-season grasses that are commonly grown in the survey area include big bluestem, indiangrass, switchgrass, and little bluestem. These grasses are native to the area and were abundant before the early days of settlement. Originally, about 80 percent of the survey area was covered by warm-season grasses. These grasses became dominant because of their adaptation to the soils and climate of the county. Their suitability for the climate is demonstrated during the hot summer months of June, July, and August. These grasses peak in production when the temperature reaches 90 degrees F. Growth slows when temperatures fall below 70 degrees. Warm-season grasses need only about 40 percent as much water as cool-season grasses to produce the same amount of forage.

Strict management techniques are necessary for optimum production and longevity of warm-season grasses. Rotation grazing allows these grasses to be used while they are growing vigorously and eliminates

overgrazing during dormant periods. Minimum grazing height guidelines must be followed. Warm-season grasses need less supplemental fertilizer than cool-season grasses. Generally, nitrogen is the only supplement necessary for optimum production.

Legumes are included in many forage systems in Pettis County. They improve overall forage quality and quantity. When included with grasses in a seeding mixture, legumes stimulate growth of the grasses because of nitrogen fixation by bacteria on the roots of the legumes.

Pure stands of legumes provide a source of high-protein forage. Some legumes, such as alfalfa and ladino clover, can cause bloating if unrestricted grazing is allowed; therefore, most pure legume stands are used for hay. Alfalfa is the legume most commonly used for hay production. Other legumes, such as red clover, birdsfoot trefoil, and ladino clover, are used in mixtures. Crownvetch is used to stabilize steep banks and severely eroding areas.

Proper management of legumes involves selecting soils that are compatible with the growth characteristics of the various plants. Most legumes require well drained or moderately well drained, very deep soils for healthy, productive stands. Bluelick, Cotter, Dameron, Pembroke, and Wakenda soils are examples. Some legumes, such as alsike clover, can grow well in areas of the wetter soils. This soil survey can facilitate the selection of the most productive species for specific soils.

Legumes do not need supplemental nitrogen because of the natural fixation that occurs in the root system. When used for hay, legumes generally require large amounts of phosphorus and potassium. Heavy applications of limestone also are needed for optimum production on most soils.

The production of cool-season grasses, warm-season grasses, and legumes peaks at different periods during the growing season. Management plans that include all three kinds of forage make optimum use of the entire season. Combining such a balanced system with rotation grazing can increase production and helps to protect the topsoil by maintaining a permanent cover of vegetation.

On all of the soils in the survey area, timely mowing or chemical weed control reduces competition from undesirable plants and encourages uniform grazing. Overgrazing reduces production of grasses and legumes and increases weed growth. Grazing when the soil is too wet causes surface compaction, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Specialty crops, such as apples, peaches, sunflowers, and Christmas trees, are grown on a limited basis in Pettis County. These crops require special equipment, management, and propagation techniques. This soil survey can help to identify areas that are suitable for such crops if specific soil-related requirements are known.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major

and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit *(10)*. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Stuart F. Miller, soil scientist, and Douglas C. Wallace, forester, Soil Conservation Service, helped prepare this section.

In 1986, approximately 50,515 acres in Pettis County, or about 11 percent of the total area, was forested, according to the Missouri Department of Conservation. Woodland tracts in the county are primarily small, private holdings of 10 to 50 acres and are essentially unmanaged. Tree species and growth rates in the county vary, depending on site conditions, soil types, and past management.

The soil serves as a reservoir for moisture, provides an anchor for roots, and supplies essential plant nutrients. Soil properties that affect the growth of trees include reaction (pH), fertility, drainage, texture, structure, and soil depth. Trees grow best on soils whose properties do not fall in the extreme range and that have an effective rooting depth of more than 40 inches.

Site characteristics that affect tree growth include aspect and topographic position. These site characteristics influence the amount of available sunlight, air drainage, soil temperature, soil moisture, and relative humidity. North- and east-facing slopes and low positions on the slope are generally the best upland sites for tree growth because they are cooler and have better moisture conditions than south- and west-facing slopes.

Management practices can influence woodland productivity. They can minimize the factors that reduce productivity. These practices include thinning young stands, harvesting mature trees, preventing fire, and eliminating the use of woodland for grazing. Fire and grazing have a very negative impact on forest growth and quality. Forest fires are no longer a major problem in the county, but about 44 percent of the woodland is used for grazing. Grazing destroys the leaf layer, compacts the soil, and destroys or damages seedlings. Woodland sites that are not used for grazing and that are protected from fire have the highest potential for production.

Information concerning the management, harvesting, marketing, or utilization of woodlands is available from the Missouri Department of Conservation, Forestry Division, or the local office of the Soil and Water Conservation District.

In areas of the Dockery-Tanglenook-Lamine association and along the major watercourses in other associations, Dockery and Lamine soils support bottom-land hardwoods that are adapted to the poorly drained

soil conditions. Most areas of these soils have been cleared for crop production. The remaining wooded areas typically support silver maple, hackberry, American elm, sycamore, cottonwood, and pin oak. Bur oak, shellbark hickory, and walnut are common along the smaller stream bottoms and on the higher terraces of the major streams. A high potential for excellent forest growth exists on these sites.

The upland soils in the Pershing-Greenton-Dockery association have a perched high water table, and the bottom-land areas are frequently flooded. The bottom-land soils typically support silver maple, hackberry, American elm, sycamore, cottonwood, and pin oak. Upland sites typically support pin oak, shingle oak, swamp white oak, hackberry, and American elm.

The soils in the Arispe-Macksburg-Greenton and Hartwell associations formed primarily under prairie vegetation. Most of the woodland on these soils is along fence rows and drainageways.

The soils in the Bluelick-Goss-Pembroke association typically support white oak, northern red oak, black oak, and sugar maple. Post oak, chinkapin oak, hickories, and eastern redcedar are common in areas of the drier Goss soils. Undisturbed forested areas of Pembroke and Bluelick soils are highly productive.

Areas of woodland are scattered throughout the Maplewood-Paintbrush-Eldon association, mainly in areas of the Eldon soils. White oak and northern red oak are the dominant species.

In the Eldon-Paintbrush-Bahner association, the Paintbrush and Bahner soils have a root-restricting dense layer in the subsoil. Generally, woodland productivity is moderate on these soils in areas where rooting depth is more than 30 inches. Where this dense layer is nearer the surface, however, productivity is reduced. White oak and northern red oak are common on the north- and east-facing slopes and in areas of the deeper Eldon soils.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and N.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be

a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

Stuart F. Miller, soil scientist, Soil Conservation Service, helped prepare this section.

Outdoor recreation in Pettis County is largely limited to private property with restricted public access. The Missouri Department of Conservation manages three native prairie tracts in southern Pettis County. The breeding habitat of several species of rare prairie flora and fauna is preserved and protected on these lands. Most notably, prairie chickens (fig. 8) need remnant prairie habitat for breeding success. Hiking, nature study, and bird watching are permitted in these areas.

Sites of historical interest include Bothwell Lodge, which is north of Sedalia on U.S. Highway 65, and the old Sedalia business district. Bothwell Lodge is operated by the Missouri Department of Natural Resources. The city of Sedalia has six public parks with swimming pools, tennis courts, ball diamonds, soccer fields, and public fishing areas. There are two public golf courses and one private course in the county.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent

Figure 8.—Prairie chickens are rare because of the destruction of native prairies. The restoration and improvement of areas of prairie vegetation provide habitat for existing flocks of this species. (Photograph by Jim Rathert, Missouri Department of Conservation)

and the ability of the soil to support vegetation also are important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to

heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Kenneth V. Kriewitz, wildlife biologist, Missouri Department of Conservation, helped prepare this section.

Pettis County is one of 13 counties in Missouri that make up the West Prairie Zoogeographic Region. About 80 percent of the county was native prairie when the first European settlers arrived *(8)*.

Pettis County borders the Western Ozark Border on the south and east, where common boundaries are shared with Benton and Cooper Counties. In these regions the vast open lands intermingle with Ozark woodlands, creating interesting and scenic ecosystems. This mixing of ecosystems creates an extensive ecotone, or "edge." Many wildlife species thrive in areas of this type of habitat.

Originally, areas of the Hartwell and Arispe-Macksburg-Greenton associations were native prairies. The Bluelick-Goss-Pembroke association was dominantly forested. The rest of the survey area was a transition zone, and the extent of the prairie and forest vegetation varied through time. Although most of the native prairies are gone forever, several small remnant prairies still exist in Pettis County. The original prairies have generally been replaced with cool-season grasses and cropland. Many forested areas have been cleared, but significant areas of woodland still exist because the soils have stones on the surface, which generally preclude common agricultural uses.

Whitetail deer are found throughout the county (fig. 9). Brushy draws and fence rows in combination with grasslands and crop fields provide suitable habitat for this species in western Pettis County, and scattered areas of woodland, cropland, and pastures provide habitat in the eastern half of the county. In 1987, 829 deer were harvested in Pettis County. The overall size of the deer herd continues to grow.

Eastern wild turkeys require a significant amount of woodland in their environment. In Pettis County this species is found only in small, scattered flocks. Generally, wild turkeys inhabit wooded areas of the Bluelick-Goss-Pembroke association in northeastern Pettis County and the Eldon-Paintbrush-Bahner association in the southeastern part of the county. In 1989, 218 turkeys were harvested in Pettis County *(6)*.

Pettis County is included in an area that historically was range for the greater prairie chicken. The vast openness of much of the county lends itself to grassland species, such as prairie chickens. Current populations of this species are relatively small based on historical standards. The best populations are generally near the boundary between Pettis and Benton Counties, near areas of native prairie.

Populations of bobwhite quail fluctuate with the weather cycles. Mild winters are generally followed by larger quail populations if favorable habitat exists. Late spring rains and summer droughts severely limit the number of bobwhite quail even in areas of good habitat. Quail thrive in habitat that includes brushy draws and fence rows combined with cropland, grassland, and heavy woody cover. A diversity of vegetation, including all of the necessary elements of cover and food, is essential. In general, quail inhabit areas throughout the county.

The habitat needs of cottontail rabbits are similar to those of bobwhite quail. The survey area includes large populations of cottontail rabbits. Brushy draws, fence rows, and field borders provide fair to excellent habitat in various parts of the county.

Fox squirrels and gray squirrels inhabit areas that are dominantly woodland. Areas of the Bluelick-Goss-

Figure 9.—Many of the soils in Pettis County, such as this area of Otter silt loam, provide excellent habitat for whitetail deer. (Photograph by Jim Rathert, Missouri Department of Conservation)

Pembroke association in the northeast and the Eldon-Paintbrush-Bahner association in the southeast generally provide the best squirrel habitat. Squirrel populations are generally fair or good throughout the county.

Numerous species of ducks and geese migrate annually through the survey area, as do doves and various nongame songbirds. Many of the lakes, ponds, and streams in the county are used as resting sites by migrating waterfowl. Many species of nonmigratory birds also inhabit areas throughout the county.

Pettis County has habitat for many native furbearers, such as red fox and coyotes. Bobcats are occasionally seen in the wooded portions of the county. Striped skunks, opossums, weasels, and raccoons also inhabit the area. Muskrats, mink, and beavers live along streams and other bodies of water.

Farm ponds, streams, and lakes provide opportunities for fishing. It is estimated that the county has more than 3,000 farm ponds and small private lakes. Many have been stocked with fish, including largemouth bass, channel catfish, and bluegill. Naturally introduced species, such as black bullhead, yellow bullhead, green sunfish, and bluegill, predominate in nonstocked ponds. Impoundments more than 10 acres in size include the Springfork Reservoir, which provides

part of Sedalia's water supply and is open to public fishing, and several private reservoirs.

Streams in the county that provide fishing opportunities include Flat Creek, Muddy Creek, and Heath's Creek and their larger tributaries (fig. 10). These waters contain several species of catfish and bullheads, largemouth bass, smallmouth bass, crappie, carp, buffalo, green sunfish, and bluegill.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated

Figure 10.—Several streams in Pettis County provide wildlife habitat and recreational opportunities.

according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, winter wheat, oats, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwoods and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water

management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping

Figure 11.—Gravel bars along several streams in Pettis County are used as a source of material for road maintenance.

and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel (fig. 11), crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the

limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

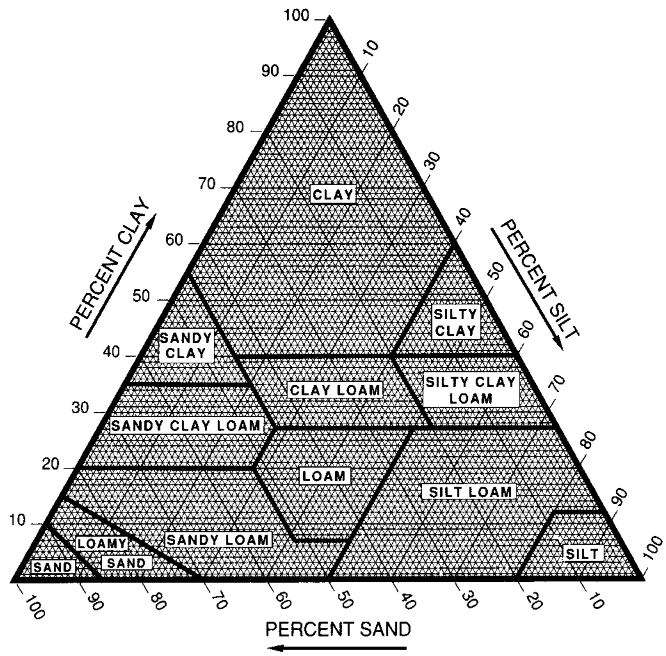


Figure 12.—Percentages of sand, silt, and clay in the basic USDA soil textural classes.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 12). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering

properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated content of clay in each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

The shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion

of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(11)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Paleudalfs (*Pale*, meaning old, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Paleudalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is clayey-skeletal, mixed, mesic Typic Paleudalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(12)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(11)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Arbela Series

The Arbela series consists of very deep, poorly drained, moderately slowly permeable soils on high stream flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Arbela silt loam; 4,640 feet south and 1,980 feet west of the northeast corner of sec. 29, T. 46 N., R. 22 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A1—7 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; many fine roots; slightly acid; clear smooth boundary.

A2—11 to 16 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; common fine roots; moderately acid; clear smooth boundary.

E1—16 to 21 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; few fine faint dark brown (10YR 3/3) mottles; moderate fine subangular blocky structure; friable; common fine roots; moderately acid; clear smooth boundary.

E2—21 to 30 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; few fine faint brown (10YR 4/3) mottles; moderate fine subangular blocky structure; friable; few fine roots; strongly acid; clear smooth boundary.

Btg1—30 to 40 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; moderately acid; clear smooth boundary.

Btg2—40 to 50 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few very fine roots; many prominent clay films on faces of peds; moderately acid; clear smooth boundary.

Btg3—50 to 60 inches; grayish brown (10YR 5/2) silty clay loam; many fine prominent yellowish brown (10YR 5/8) mottles; weak fine prismatic structure; firm; common prominent clay films on faces of peds; moderately acid.

The mollic epipedon ranges from 10 to 16 inches in thickness.

The E horizon has chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y and chroma of 1 or 2.

Arispe Series

The Arispe series consists of very deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 9 percent.

The Arispe soils in Pettis County have a dark surface layer that is thinner than is defined as the range for the series. This difference, however, does not significantly affect the use and management of the soils.

Typical pedon of Arispe silt loam, 2 to 5 percent slopes, eroded; 2,370 feet south and 33 feet east of the northwest corner of sec. 13, T. 46 N., R. 23 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine roots; moderately acid; abrupt smooth boundary.

Bt1—8 to 14 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine prominent strong brown (7.5YR 4/6) mottles; moderate very fine subangular blocky structure; firm; many fine roots; common distinct clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—14 to 19 inches; dark grayish brown (10YR 4/2) silty clay; common fine prominent strong brown (7.5YR 4/6) mottles; moderate fine subangular blocky structure; firm; common fine roots; many prominent clay films on faces of peds; moderately acid; clear smooth boundary.

Btg1—19 to 24 inches; dark grayish brown (10YR 4/2) silty clay; many fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; many prominent clay films on faces of peds; common black stains and concretions of iron and manganese oxide; moderately acid; clear smooth boundary.

Btg2—24 to 30 inches; dark grayish brown (10YR 4/2) silty clay; many fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds; moderately acid; clear smooth boundary.

Btg3—30 to 39 inches; gray (10YR 5/1) silty clay loam; many fine prominent dark yellowish brown (10YR 4/6) mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common distinct clay films on faces of peds; moderately acid; gradual smooth boundary.

Btg4—39 to 51 inches; gray (10YR 6/1) silty clay loam; many fine and medium prominent yellowish brown (10YR 5/6) mottles; weak fine prismatic structure; firm; few very fine roots; few distinct clay films on faces of peds; slightly acid; gradual smooth boundary.

Cg—51 to 60 inches; gray (10YR 6/1) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; firm; neutral.

The Ap horizon has value of 2 or 3 and chroma of 1

or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. The C horizon has value of 5 or 6 and chroma of 1 or 2.

Bahner Series

The Bahner series consists of very deep, well drained soils that have a dense layer in the subsoil. These soils are on uplands. They formed in a thin mantle of loess and in the underlying cherty dolomite residuum. Permeability is moderate above the dense layer and slow in the dense layer. Slopes range from 2 to 9 percent.

Typical pedon of Bahner silt loam, 2 to 5 percent slopes; 1,900 feet north and 350 feet east of the southwest corner of sec. 15, T. 44 N., R. 20 W.

Ap—0 to 5 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; many very fine and fine roots; few chert pebbles; neutral; clear smooth boundary.

AB—5 to 9 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate very fine subangular blocky structure; friable; common very fine and fine roots; few chert pebbles; slightly acid; clear smooth boundary.

Bt1—9 to 15 inches; brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; common very fine and fine roots; few distinct clay films on faces of peds; few chert pebbles; slightly acid; clear smooth boundary.

Bt2—15 to 22 inches; strong brown (7.5YR 4/6) silty clay loam; moderate fine subangular blocky structure; firm; few very fine and fine roots; common distinct clay films on faces of peds; few chert pebbles; moderately acid; clear smooth boundary.

Bt3—22 to 27 inches; strong brown (7.5YR 4/6) silty clay loam; weak fine subangular blocky structure; firm; few very fine roots; common prominent clay films on faces of peds; few chert pebbles; strongly acid; clear wavy boundary.

2Btx1—27 to 42 inches; yellowish red (5YR 4/6) extremely gravelly clay loam; common fine prominent brown (7.5YR 5/4) mottles; massive; very firm; common prominent clay films on some chert fragments in vertical bands about 10 inches apart; about 50 percent chert gravel and 20 percent chert cobbles; strongly acid; clear wavy boundary.

2Btx2—42 to 50 inches; pale brown (10YR 6/3) extremely gravelly clay loam; common fine faint light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; very firm; common prominent clay films on some chert fragments in vertical bands about 10 inches apart; about 50 percent chert gravel and 20 percent chert cobbles; strongly acid; clear wavy boundary.

3Bt—50 to 60 inches; red (2.5YR 4/8) gravelly clay; few fine prominent yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; very firm; common distinct clay films on faces of peds; about 10 percent chert gravel and 5 percent chert cobbles; moderately acid.

Depth to the dense layer ranges from 20 to 40 inches.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is silty clay loam or silty clay.

The 2Btx horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 8, and chroma of 2 to 8. Colors with chroma of 2 do not occur within a depth of 30 inches. This horizon is the gravelly, very gravelly, or extremely gravelly analogs of silty clay loam and clay loam.

The 3Bt horizon has hue of 2.5YR to 7.5YR, value of 4 to 6, and chroma of 6 to 8. It is gravelly clay or cobbly clay.

Barco Series

The Barco series consists of moderately deep, well drained, moderately permeable soils on uplands. These soils formed in sandstone residuum. Slopes range from 5 to 35 percent.

Typical pedon of Barco loam, 9 to 14 percent slopes; 1,550 feet north and 2,380 feet west of the southeast corner of sec. 26, T. 48 N., R. 22 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

BA—8 to 12 inches; dark yellowish brown (10YR 4/4) clay loam; moderate very fine subangular blocky structure; firm; common fine roots; slightly acid; clear smooth boundary.

Bt1—12 to 18 inches; strong brown (7.5YR 5/6) clay loam; moderate fine subangular blocky structure; firm; common fine roots; common faint clay films on faces of peds; about 10 percent sandstone gravel; slightly acid; gradual smooth boundary.

Bt2—18 to 26 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; few fine roots; common faint clay films on faces of peds; about 10 percent sandstone gravel; common fine concretions of iron and manganese oxide; moderately acid; abrupt smooth boundary.

Cr—26 to 45 inches; partially weathered sandstone.

R—45 inches; sandstone bedrock.

Some pedons have stones on the surface. The depth to soft, weathered sandstone ranges from 24 to 40 inches. The depth to hard sandstone bedrock ranges from 40 to 60 inches.

The A horizon has chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is loam or clay loam.

Bluelick Series

The Bluelick series consists of very deep, well drained, moderately slowly permeable soils on uplands. These soils formed in loess and in the underlying cherty limestone residuum. Slopes range from 2 to 16 percent.

Typical pedon of Bluelick silt loam, 9 to 16 percent slopes, eroded; 2,750 feet south and 600 feet east of the northwest corner of sec. 35, T. 48 N., R. 21 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

Bt1—7 to 12 inches; brown (7.5YR 4/4) silty clay loam; some pockets of brown (10YR 4/3) silt loam; moderate very fine subangular blocky structure; firm; few fine roots; common faint clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—12 to 17 inches; strong brown (7.5YR 4/6) silty clay; few fine prominent brown (10YR 4/3) mottles; moderate very fine subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; slightly acid; clear smooth boundary.

Bt3—17 to 24 inches; strong brown (7.5YR 4/6) silty clay; moderate very fine subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; slightly acid; clear smooth boundary.

Bt4—24 to 30 inches; yellowish red (5YR 4/6) silty clay; moderate fine subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt5—30 to 41 inches; yellowish red (5YR 4/6) very cobbly silty clay; few fine prominent reddish gray (5YR 5/2) mottles; moderate fine subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; about 20 percent chert gravel and 30 percent chert cobbles; moderately acid; gradual smooth boundary.

2Bt6—41 to 60 inches; yellowish red (5YR 4/6) very cobbly silty clay; common medium prominent brown (7.5YR 5/2) mottles; weak fine subangular blocky structure; firm; common distinct clay films on faces of peds; about 20 percent chert gravel and 30 percent chert cobbles; slightly acid.

Depth to the 2Bt horizon ranges from 20 to 40 inches.

The A horizon has value of 3 or 4. The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon has hue of 7.5YR to 2.5YR, value of 4 or 5, and chroma of 4 to 6. It is the very cobbly or very gravelly analogs of silty clay or clay.

Cotter Series

The Cotter series consists of very deep, well drained, moderately permeable soils on high stream flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Cotter silt loam; 2,500 feet south and 4,550 feet east of the northwest corner of sec. 14, T. 44 N., R. 20 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak thin platy structure parting to moderate fine granular; friable; many fine and very fine roots; moderately acid; clear smooth boundary.

A—8 to 14 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; few fine faint brown (10YR 4/3) mottles; moderate very fine subangular blocky structure; friable; many fine and very fine roots; moderately acid; clear smooth boundary.

AB—14 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; few fine faint brown (10YR 4/3) mottles; moderate very fine subangular blocky structure; friable; many fine and very fine roots; slightly acid; clear smooth boundary.

Bt1—18 to 23 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine faint dark brown (10YR 3/3) mottles; moderate medium subangular blocky structure; firm; many fine and very fine roots; common faint clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—23 to 30 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; common fine and very fine roots; common faint clay films on faces of peds; moderately acid; clear smooth boundary.

Bt3—30 to 37 inches; brown (10YR 4/3) silty clay loam; moderate medium prismatic structure parting to weak medium subangular blocky; firm; common fine and very fine roots; few faint clay films on faces of peds; slightly acid; clear smooth boundary.

BC—37 to 45 inches; brown (10YR 4/3) loam; moderate medium prismatic structure; firm; few very fine

roots; neutral; clear smooth boundary.
C—45 to 60 inches; brown (10YR 4/3) loam; massive; firm; few very fine roots; neutral.

The thickness of the mollic epipedon ranges from 24 to 34 inches. The lower part of the Bt horizon and the BC horizon have chroma of 3 or 4.

Dameron Series

The Dameron series consists of very deep, well drained, moderately permeable soils on narrow flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Dameron silt loam; 1,350 feet south and 1,000 feet west of the northeast corner of sec. 11, T. 46 N., R. 22 W.

A1—0 to 23 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure; friable; common fine roots; neutral; gradual smooth boundary.
A2—23 to 32 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; common thin strata of brown (10YR 4/3) very fine sandy loam; weak very fine subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.
2C1—32 to 48 inches; very dark grayish brown (10YR 3/2) very gravelly silty clay loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; firm; few very fine roots; about 40 percent chert gravel and 15 percent chert cobbles; neutral; gradual smooth boundary.
2C2—48 to 60 inches; very dark grayish brown (10YR 3/2) very gravelly silty clay loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; firm; about 40 percent chert gravel and 20 percent chert cobbles; neutral.

Depth to the gravelly or very gravelly layer ranges from 25 to 40 inches. The mollic epipedon ranges from 24 to more than 60 inches in thickness. The A horizon has value and chroma of 2 or 3. The 2C horizon has value of 3 or 4 and chroma of 2 to 4. It is the gravelly or very gravelly analogs of silty clay loam or clay loam.

Dockery Series

The Dockery series consists of very deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Dockery silt loam; 1,710 feet north and 1,080 feet east of the southwest corner of sec. 26, T. 48 N., R. 23 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; massive with thin distinct bedding planes; friable; many fine roots; slightly acid; clear smooth boundary.
C1—7 to 37 inches; dark grayish brown (10YR 4/2) silt loam; thin dark brown (10YR 3/3) strata; few fine prominent dark yellowish brown (10YR 4/6) mottles; massive with thin distinct bedding planes; friable; common fine roots; slightly acid; clear smooth boundary.
C2—37 to 60 inches; dark brown (10YR 3/3) silt loam; strata of dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4); massive with thin distinct bedding planes; friable; few fine roots; slightly acid.

The C horizon has value of 3 to 5 and chroma of 2 or 3.

Eldon Series

The Eldon series consists of very deep, well drained, moderately permeable soils on uplands. These soils formed in cherty limestone or dolomite residuum. Slopes range from 3 to 14 percent.

Typical pedon of Eldon gravelly silt loam, 3 to 9 percent slopes; 420 feet south and 260 feet west of the northeast corner of sec. 33, T. 44 N., R. 21 W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) gravelly silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; many fine and very fine roots; about 25 percent chert gravel; moderately acid; clear smooth boundary.
BA—7 to 14 inches; dark brown (10YR 3/3) very gravelly silty clay loam, brown (10YR 5/3) dry; moderate very fine subangular blocky structure; firm; many fine and very fine roots; about 60 percent chert gravel; moderately acid; clear smooth boundary.
Bt1—14 to 22 inches; yellowish red (5YR 5/8) very gravelly silty clay loam; moderate very fine subangular blocky structure; firm; common distinct clay films on faces of peds; common very fine roots; about 35 percent chert gravel and 15 percent chert cobbles; moderately acid; clear smooth boundary.
Bt2—22 to 28 inches; red (2.5YR 5/6) very gravelly clay; moderate fine subangular blocky structure; firm; many prominent clay films on faces of peds; few very fine roots; about 40 percent chert gravel; strongly acid; clear smooth boundary.
2Bt3—28 to 36 inches; brown (10YR 5/3) and red (2.5YR 5/6) gravelly clay; moderate fine subangular blocky structure; firm; many prominent clay films on faces of peds; few very fine roots; about 15 percent

chert gravel; very strongly acid; gradual smooth boundary.

2Bt4—36 to 48 inches; brown (10YR 5/3) and red (2.5YR 5/6) clay; few fine faint light gray (10YR 7/2) mottles; moderate fine subangular blocky structure; firm; many distinct clay films on faces of peds; about 10 percent chert gravel; moderately acid; gradual smooth boundary.

2Bt5—48 to 60 inches; red (2.5YR 4/6) and brownish yellow (10YR 6/6) gravelly clay; moderate fine subangular blocky structure; firm; many distinct clay films on faces of peds; about 20 percent chert gravel; slightly acid.

The A horizon has value and chroma of 2 or 3. The Bt horizon has hue of 2.5YR to 10YR and chroma of 3 to 6. It is silty clay loam, silty clay, or clay or the gravelly or very gravelly analogs of these textures. The 2Bt horizon is clay, gravelly clay, or very gravelly clay.

Friendly Series

The Friendly series consists of very deep, somewhat poorly drained soils that have a dense layer in the subsoil. These soils are on uplands. They formed in a thin mantle of loess and in the underlying cherty dolomite residuum. Permeability is slow. Slopes range from 1 to 4 percent.

Typical pedon of Friendly silt loam, 1 to 4 percent slopes, eroded; 1,880 feet south and 500 feet east of the northwest corner of sec. 29, T. 44 N., R. 21 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many fine and very fine roots; few chert pebbles; slightly acid; clear smooth boundary.

Bt1—6 to 13 inches; brown (7.5YR 4/2) silty clay; common fine distinct brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; firm; many fine and very fine roots; many prominent clay films on faces of peds; few chert pebbles; moderately acid; clear smooth boundary.

Bt2—13 to 23 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and few fine faint brown (10YR 5/3) mottles; moderate fine subangular blocky structure; firm; common very fine roots; common distinct clay films on faces of peds; few chert pebbles; neutral; clear smooth boundary.

Bt3—23 to 31 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; few chert pebbles; slightly alkaline; gradual smooth boundary.

2Btx1—31 to 40 inches; yellowish brown (10YR 5/6) extremely gravelly silty clay loam; many fine prominent grayish brown (10YR 5/2) mottles; massive; very firm; common prominent clay films on some chert fragments in vertical bands about 10 inches apart; about 60 percent chert gravel and 15 percent chert cobbles; slightly alkaline; clear smooth boundary.

2Btx2—40 to 48 inches; brown (7.5YR 5/4) extremely gravelly silty clay loam; few fine distinct pinkish gray (7.5YR 6/2) mottles; massive; very firm; common prominent clay films on some chert fragments in vertical bands about 10 inches apart; about 60 percent chert gravel and 15 percent chert cobbles; slightly alkaline; clear smooth boundary.

2Btx3—48 to 54 inches; strong brown (7.5YR 5/6) extremely gravelly clay loam; few fine prominent pinkish gray (7.5YR 6/2) mottles; moderate angular blocky structure; very firm; common prominent clay films on faces of peds; about 50 percent chert gravel and 15 percent chert cobbles; slightly alkaline; clear smooth boundary.

3Bt—54 to 60 inches; red (2.5YR 4/8) clay; common fine prominent light gray (10YR 7/2) mottles; weak medium subangular blocky structure; very firm; common distinct clay films on faces of peds; about 10 percent chert gravel; neutral.

Depth to the dense layer ranges from 20 to 40 inches.

The Bt horizon has value of 4 to 6 and chroma of 1 to 6. The 2Btx horizon has hue of 10YR to 2.5YR, value of 4 to 6, and chroma of 1 to 8. It is silt loam, silty clay loam, or clay loam or the gravelly to extremely cobbly analogs of these textures. The 3Bt horizon has hue of 7.5YR to 2.5YR, value of 4 to 6, and chroma of 4 to 8. It is clay or silty clay or the gravelly and cobbly analogs of these textures.

Goss Series

The Goss series consists of very deep, well drained, moderately permeable soils on uplands. These soils formed in cherty limestone or dolomite residuum. Slopes range from 14 to 35 percent.

Typical pedon of Goss very cobbly silt loam, 14 to 35 percent slopes; 1,200 feet north and 490 feet west of the southeast corner of sec. 11, T. 46 N., R. 22 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) very cobbly silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine roots; about 20 percent chert gravel and 35 percent chert cobbles; moderately acid; clear smooth boundary.

E1—3 to 9 inches; brown (10YR 5/3) very cobbly silt loam; moderate fine granular structure; friable; common fine roots; about 20 percent chert gravel and 35 percent chert cobbles; very strongly acid; clear smooth boundary.

E2—9 to 15 inches; pale brown (10YR 6/3) very cobbly silt loam; moderate fine granular structure; friable; common fine roots; about 20 percent chert gravel and 35 percent chert cobbles; very strongly acid; clear smooth boundary.

BE—15 to 22 inches; yellowish brown (10YR 5/6) very cobbly silt loam; moderate very fine subangular blocky structure; firm; common fine roots; many prominent silt coatings on faces of peds; about 20 percent chert gravel and 35 percent chert cobbles; very strongly acid; clear smooth boundary.

Bt1—22 to 31 inches; yellowish red (5YR 4/6) very cobbly clay; common coarse prominent brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; about 15 percent chert gravel and 35 percent chert cobbles; strongly acid; gradual smooth boundary.

Bt2—31 to 40 inches; yellowish red (5YR 4/6) very cobbly clay; common fine distinct strong brown (7.5YR 4/6) mottles; moderate fine subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; about 15 percent chert gravel and 35 percent chert cobbles; strongly acid; gradual smooth boundary.

Bt3—40 to 55 inches; brownish yellow (10YR 6/6) very cobbly clay; many fine prominent yellowish red (5YR 5/8) mottles; few black stains of iron and manganese oxide; weak medium subangular blocky structure; very firm; few very fine roots; common distinct clay films on faces of peds; about 15 percent chert gravel and 35 percent chert cobbles; strongly acid; gradual smooth boundary.

C—55 to 60 inches; strong brown (7.5YR 5/8) and yellowish brown (10YR 5/8) very cobbly clay; massive; very firm; about 15 percent chert gravel and 35 percent chert cobbles; neutral.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 2 or 3. It is the cobbly or very cobbly analogs of silt loam. The E horizon has hue similar to that of the A horizon and has value of 4 to 6 and chroma of 3. It has textures similar to those of the A horizon. The Bt horizon is the cobbly or very cobbly analogs of silty clay or clay. The upper part has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 8. The lower part has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 4 to 8.

Greenton Series

The Greenton series consists of deep and very deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in a thin mantle of loess and in the underlying limestone and shale residuum. Slopes range from 2 to 14 percent.

The Greenton soils in Pettis County have a dark surface layer that is thinner than is defined as the range for the series. This difference, however, does not significantly affect the use and management of the soils.

Typical pedon of Greenton silt loam, bedrock substratum, 5 to 9 percent slopes, eroded; 630 feet north and 2,330 feet east of the southwest corner of sec. 35, T. 47 N., R. 23 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

BA—7 to 12 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct dark yellowish brown (10YR 3/4) mottles; weak very fine subangular blocky structure; firm; common fine roots; moderately acid; clear smooth boundary.

Bt1—12 to 16 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; firm; common fine roots; few distinct clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—16 to 22 inches; grayish brown (10YR 5/2) silty clay loam; many medium prominent strong brown (7.5YR 5/8) and many medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; common prominent clay films on faces of peds; about 5 percent soft shale fragments; moderately acid; clear smooth boundary.

Bt3—22 to 29 inches; brown (10YR 5/3) and yellowish brown (10YR 5/6) silty clay; common fine prominent strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; about 5 percent soft shale fragments; moderately acid; clear smooth boundary.

2Bt4—29 to 38 inches; yellowish brown (10YR 5/6) silty clay; common fine distinct yellowish brown (10YR 5/8) and few fine prominent light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; few very fine roots; few faint clay films on faces of peds; about 13 percent soft shale fragments; neutral; clear smooth boundary.

2C—38 to 48 inches; yellowish brown (10YR 5/6) silty clay; many fine prominent light brownish gray (2.5Y 6/2) and few medium distinct strong brown (7.5YR 4/6) mottles; massive; firm; about 13 percent soft shale fragments; neutral; clear smooth boundary.

2Cr—48 to 60 inches; thinly bedded shale.

The depth to weathered bedrock ranges from 44 to more than 60 inches.

The Ap horizon is silt loam or silty clay loam. It has chroma of 1 or 2. The Bt horizon has hue of 2.5Y or 10YR, value of 3 to 5, and chroma of 2 to 6. The 2Bt horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 8. The 2C horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 to 6.

Haig Series

The Haig series consists of very deep, poorly drained, slowly permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 2 percent.

Typical pedon of Haig silt loam; 1,220 feet north and 200 feet west of the southeast corner of sec. 26, T. 47 N., R. 22 W.

Ap—0 to 6 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A1—6 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; many fine roots; slightly acid; clear smooth boundary.

A2—10 to 16 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; firm; many fine roots; silt coatings on faces of some peds; moderately acid; clear smooth boundary.

BA—16 to 20 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; common fine roots; common faint organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt—20 to 28 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; common fine roots; many prominent clay films on faces of peds; moderately acid; clear smooth boundary.

Btg—28 to 45 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds; slightly acid; clear smooth boundary.

BCg—45 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and common fine prominent yellowish brown (10YR 5/4) mottles; weak fine prismatic structure; firm; few fine roots; few faint clay films on vertical faces of prisms; slightly acid.

The mollic epipedon ranges from about 24 to 28 inches in thickness.

The A horizon has value of 2 or 3. The Bt horizon has value of 3 or 4. The Btg and BCg horizons have value of 4 or 5 and chroma of 1 or 2.

Hartwell Series

The Hartwell series consists of very deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 3 percent.

Typical pedon of Hartwell silt loam, foot slopes, 0 to 1 percent slopes; 2,580 feet north and 110 feet west of the southeast corner of sec. 29, T. 44 N., R. 23 W.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

E—8 to 14 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bt—14 to 22 inches; very dark grayish brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; common fine prominent dark brown (7.5YR 3/4) mottles; weak fine subangular blocky structure; firm; common fine roots; many distinct clay films on faces of peds; neutral; clear smooth boundary.

Btg1—22 to 28 inches; dark grayish brown (10YR 4/2) silty clay; many fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; neutral; clear smooth boundary.

Btg2—28 to 35 inches; gray (10YR 6/1) silty clay; common fine prominent strong brown (7.5YR 4/6) mottles; moderate fine subangular blocky structure; firm; few very fine roots; many distinct clay films on faces of peds; neutral; clear smooth boundary.

Btg3—35 to 42 inches; gray (10YR 6/1) silty clay; many medium distinct very dark gray (10YR 3/1) streaks and few fine prominent dark yellowish brown (10YR 4/6) mottles; weak fine subangular blocky structure; firm; common distinct clay films on faces of peds; neutral; clear smooth boundary.

Btg4—42 to 53 inches; grayish brown (10YR 5/2) silty clay; few fine distinct dark yellowish brown (10YR

4/4) mottles; weak fine prismatic structure; firm; common distinct clay films on faces of peds; neutral; clear smooth boundary.
Cg—53 to 60 inches; gray (10YR 6/1) silty clay loam; common fine prominent yellowish brown (10YR 5/8) mottles; massive; firm; neutral.

The mollic epipedon ranges from 10 to 19 inches in thickness.

The upper part of the Bt horizon has value of 2 or 3 and chroma of 1 or 2. The lower part has hue of 10YR or 2.5Y and value of 4 to 6.

Hartwell silt loam, 1 to 3 percent slopes, eroded, does not have the E horizon that is definitive for the Hartwell series. This difference, however, does not significantly affect the use and management of the soil.

Lamine Series

The Lamine series consists of very deep, somewhat poorly drained, very slowly permeable soils on high stream flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Lamine silt loam; 75 feet north and 1,050 feet east of the southwest corner of sec. 16, T. 45 N., R. 23 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; moderate very fine granular structure; very friable; common fine roots; neutral; clear smooth boundary.
E—6 to 10 inches; light brownish gray (10YR 6/2) silt loam; moderate fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.
BEg—10 to 14 inches; light brownish gray (10YR 6/2) silty clay loam; few fine distinct light yellowish brown (10YR 6/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; common distinct silt coatings on faces of peds; moderately acid; abrupt smooth boundary.
Btg1—14 to 19 inches; grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4) and few fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; slightly acid; clear smooth boundary.
Btg2—19 to 28 inches; grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4) and common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; slightly acid; gradual smooth boundary.
Btg3—28 to 39 inches; light brownish gray (10YR 6/2) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few distinct clay films on faces of peds; slightly acid; gradual smooth boundary.
BCg—39 to 55 inches; gray (10YR 6/1) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; weak fine prismatic structure; firm; few faint clay films on faces of peds; neutral; clear smooth boundary.
Cg—55 to 60 inches; gray (10YR 6/1) silty clay; many medium prominent yellowish brown (10YR 5/6) mottles; massive; firm; neutral.

The Ap horizon has value of 4 to 6. The E horizon has value of 5 or 6. The Btg horizon has value of 4 to 6 and chroma of 1 or 2. The C horizon has value of 5 or 6 and chroma of 1 or 2.

Macksburg Series

The Macksburg series consists of very deep, somewhat poorly drained, moderately slowly permeable soils on uplands. These soils formed in loess. Slopes range from 1 to 5 percent.

Typical pedon of Macksburg silt loam, 1 to 5 percent slopes; 1,450 feet north and 60 feet east of the southwest corner of sec. 8, T. 47 N., R. 23 W.

Ap—0 to 6 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.
A—6 to 11 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine angular blocky structure; firm; many fine roots; moderately acid; clear smooth boundary.
AB—11 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; few fine faint dark grayish brown (10YR 4/2) mottles; moderate very fine subangular blocky structure; firm; common fine roots; strongly acid; clear smooth boundary.
Bt1—18 to 23 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine faint dark brown (10YR 4/3) mottles; moderate fine subangular blocky structure; firm; common fine roots; common faint clay films on faces of peds; strongly acid; clear smooth boundary.
Bt2—23 to 30 inches; mottled dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4), and yellowish brown (10YR 5/6) silty clay; moderate fine subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; moderately acid; clear smooth boundary.
Btg1—30 to 44 inches; grayish brown (2.5Y 5/2) and

light olive brown (2.5Y 5/4) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine prismatic structure; firm; few fine roots; common prominent clay films on faces of peds; neutral; gradual smooth boundary.

Btg2—44 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/4) and few fine prominent yellowish brown (10YR 5/6) mottles; weak fine prismatic structure; firm; few very fine roots; common faint clay films on faces of peds; neutral.

The mollic epipedon ranges from 16 to 28 inches in thickness.

The Btg horizon has value of 5 or 6. The C horizon, if it occurs, has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 4.

Maplewood Series

The Maplewood series consists of very deep, somewhat poorly drained soils that have a dense layer in the subsoil. These soils are on uplands. They formed in a thin mantle of loess and in the underlying cherty limestone or dolomite residuum. Permeability is slow. Slopes range from 2 to 5 percent.

Typical pedon of Maplewood silt loam, 2 to 5 percent slopes, eroded; 2,400 feet north and 1,300 feet east of the southwest corner of sec. 9, T. 45 N., R. 20 W.

Ap—0 to 6 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak thin platy structure parting to weak fine granular; friable; common very fine, fine, and medium roots; few chert pebbles; neutral; clear smooth boundary.

Bt1—6 to 10 inches; brown (7.5YR 4/2) silty clay loam; common fine prominent dark reddish brown (5YR 3/4) and common fine prominent yellowish brown (10YR 5/4) mottles; strong fine subangular blocky structure; firm; common very fine, fine, and medium roots; many prominent clay films on faces of peds; few chert pebbles; neutral; clear smooth boundary.

Bt2—10 to 17 inches; brown (7.5YR 4/4) silty clay; many medium prominent yellowish red (5YR 4/6) and few fine distinct brown (7.5YR 5/2) mottles; strong fine and medium subangular blocky structure; firm; common very fine, fine, and medium roots; many prominent dark brown (7.5YR 3/2) clay films on faces of peds; few chert pebbles; slightly acid; clear smooth boundary.

Btx1—17 to 24 inches; brown (7.5YR 4/4) silty clay loam; few fine distinct brown (7.5YR 5/2) mottles; moderate fine prismatic structure; very firm; few very fine, fine, and medium roots between peds; many prominent clay films on faces of peds; moderately brittle; about 5 percent chert gravel; neutral; gradual smooth boundary.

Btx2—24 to 32 inches; brown (7.5YR 4/4) silty clay loam; few fine distinct pinkish gray (7.5YR 6/2) and common fine faint brown (7.5YR 5/4) mottles; strong very coarse prismatic structure; very firm; few very fine, fine, and medium roots between peds; many prominent clay films on faces of peds; moderately brittle; about 5 percent chert gravel; slightly acid; clear smooth boundary.

2Bt1—32 to 46 inches; brown (7.5YR 5/4) very cobbly silty clay; common fine faint brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; few very fine and fine roots; common distinct clay films on faces of peds and common dark brown stains on peds; about 40 percent chert gravel and 20 percent chert cobbles; slightly acid; gradual smooth boundary.

2Bt2—46 to 55 inches; yellowish red (5YR 5/6) very cobbly clay; common medium prominent brownish yellow (10YR 6/8) mottles; moderate fine subangular blocky structure; firm; few very fine and fine roots; many prominent clay films on faces of peds; about 30 percent chert gravel and 25 percent chert cobbles; moderately acid; clear smooth boundary.

2Bt3—55 to 60 inches; strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) clay; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; many prominent clay films on faces of peds; about 5 percent chert gravel and 5 percent chert cobbles; slightly acid.

Depth to the Btx horizon ranges from 16 to 36 inches.

The A horizon has chroma of 2 or 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. The Btx horizon is silt loam, silty clay loam, or the gravelly to extremely cobbly analogs of these textures. It has colors similar to those of the Bt horizon. The 2Bt horizon has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. It is silty clay or clay or the gravelly to very cobbly analogs of these textures.

Moko Series

The Moko series consists of very shallow and shallow, well drained, moderately permeable soils on uplands. These soils formed in limestone or dolomite residuum. Slopes range from 5 to 50 percent.

Typical pedon of Moko very channery loam, 14 to 50 percent slopes; 2,130 feet north and 1,070 feet east of the southwest corner of sec. 14, T. 47 N., R. 20 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2)

very channery loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; many fine and very fine roots; about 35 percent channers and 5 percent flagstones; strong effervescence; slightly alkaline; clear smooth boundary.

A2—4 to 7 inches; very dark grayish brown (10YR 3/2) very channery clay loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; many fine and very fine roots; about 40 percent channers and 15 percent flagstones; strong effervescence; slightly alkaline; abrupt smooth boundary.

R—7 inches; limestone bedrock, fractured in the upper part.

The depth to lithic contact ranges from 6 to 20 inches.

Nevin Series

The Nevin series consists of very deep, somewhat poorly drained, moderately permeable soils on high stream flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Nevin silt loam; 1,360 feet north and 570 feet west of the southeast corner of sec. 36, T. 45 N., R. 20 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A—7 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; many fine roots; moderately acid; clear smooth boundary.

BA—15 to 22 inches; dark grayish brown (10YR 4/2) silt loam; few fine faint brown (10YR 4/3) mottles; moderate very fine subangular blocky structure; friable; common fine roots; moderately acid; clear smooth boundary.

Bt—22 to 31 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; common fine roots; common distinct clay films on faces of peds; few fine concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Btg1—31 to 38 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; slightly acid; clear smooth boundary.

Btg2—38 to 46 inches; gray (10YR 5/1) silty clay loam; common fine prominent dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; firm; few very fine roots; common faint clay films on faces of peds; neutral; gradual smooth boundary.

BCg—46 to 60 inches; gray (10YR 5/1) silty clay loam; common fine prominent dark yellowish brown (10YR 4/6) mottles; weak fine subangular blocky structure; firm; neutral.

The A horizon has value and chroma of 2 or 3. It ranges from 15 to 24 inches in thickness. It is loam or silt loam or the very channery analogs of these textures. The Bt horizon has hue of 2.5Y or 10YR.

Otter Series

The Otter series consists of very deep, poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Otter silt loam; 1,950 feet south and 1,400 feet east of the northwest corner of sec. 36, T. 48 N., R. 23 W.

A1—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

A2—9 to 31 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; common fine roots; slightly acid; gradual smooth boundary.

Bg—31 to 60 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent dark yellowish brown (10YR 4/6) mottles; weak fine subangular blocky structure; firm; few fine roots; few silt coatings on faces of peds; slightly acid.

The thickness of the mollic epipedon ranges from 31 to more than 60 inches. The Bg horizon is silty clay loam, sandy loam, or silt loam. The Cg horizon, if it occurs, has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2.

Paintbrush Series

The Paintbrush series consists of very deep, moderately well drained soils that have a dense layer in the subsoil. These soils are on uplands. They formed in a thin mantle of loess and in the underlying cherty limestone or dolomite residuum. Permeability is moderate above the dense layer and slow in the dense layer. Slopes range from 2 to 9 percent.

Typical pedon of Paintbrush silt loam, 5 to 9 percent

slopes; 1,200 feet south and 210 feet west of the northeast corner of sec. 29, T. 44 N., R. 21 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; very friable; few chert pebbles; common fine and medium roots; strongly acid; clear smooth boundary.

Bt1—9 to 13 inches; dark brown (10YR 4/3) silty clay loam; moderate very fine subangular blocky structure; friable; few distinct clay films on faces of peds; few chert pebbles; common fine and medium roots; strongly acid; clear smooth boundary.

Bt2—13 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine prominent yellowish red (5YR 4/6) mottles; moderate fine subangular blocky structure; firm; common distinct clay films on faces of peds; about 10 percent chert gravel; common fine roots; strongly acid; clear smooth boundary.

2Btx1—21 to 30 inches; grayish brown (10YR 5/2) extremely cobbly silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; very firm; few distinct clay films on vertical faces of some chert fragments; about 40 percent chert gravel and 35 percent chert cobbles; few fine roots in the upper part; strongly acid; clear smooth boundary.

2Btx2—30 to 37 inches; brown (10YR 5/3) extremely cobbly clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; very firm; few distinct clay films on vertical faces of some chert fragments; moderately brittle; about 40 percent chert gravel and 35 percent chert cobbles; strongly acid; clear smooth boundary.

2Btx3—37 to 43 inches; strong brown (7.5YR 5/6) gravelly clay loam; many medium distinct reddish yellow (5YR 6/6) mottles; weak medium subangular blocky structure; very firm; few distinct clay films on vertical faces of some chert fragments; moderately brittle; about 20 percent chert gravel; moderately acid; clear smooth boundary.

3Bt1—43 to 52 inches; mottled red (2.5YR 4/6) and strong brown (7.5YR 5/8) clay; weak very fine angular blocky structure; very firm; many prominent clay films on faces of peds; about 10 percent chert gravel; slightly acid; clear smooth boundary.

3Bt2—52 to 60 inches; strong brown (7.5YR 5/8) clay; common medium prominent red (2.5YR 4/6) mottles; weak very fine angular blocky structure; very firm; many prominent clay films on faces of peds; about 10 percent chert gravel; slightly acid.

Depth to the Btx horizon ranges from 18 to 36 inches.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The 2Btx horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. It is the gravelly to extremely cobbly analogs of silt loam, silty clay loam, or clay loam. The 3Bt horizon has hue of 2.5YR to 7.5YR, value of 3 to 6, and chroma of 4 to 8.

Pembroke Series

The Pembroke series consists of very deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 16 percent.

Typical pedon of Pembroke silt loam, 2 to 5 percent slopes; 85 feet south and 1,200 feet west of the northeast corner of sec. 20, T. 46 N., R. 21 W.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; neutral; many fine roots; abrupt smooth boundary.

E—7 to 11 inches; dark brown (10YR 4/3) silt loam; moderate very fine subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

Bt1—11 to 18 inches; dark brown (10YR 4/3) silty clay loam; moderate very fine subangular blocky structure; firm; common fine roots; common faint clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—18 to 24 inches; brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—24 to 31 inches; brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; many faint clay films on faces of peds; strongly acid; clear smooth boundary.

Bt4—31 to 41 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few very fine roots; common faint clay films on faces of peds; strongly acid; clear smooth boundary.

2Bt5—41 to 51 inches; yellowish red (5YR 4/6) silty clay loam; weak medium subangular blocky structure; firm; few very fine roots; common prominent clay films on faces of peds; strongly acid; clear smooth boundary.

2BC—51 to 60 inches; yellowish red (5YR 4/6) silty clay loam; few medium prominent dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; strongly acid.

The A horizon has chroma of 2 or 3. The Bt horizon is silty clay loam or silty clay. The lower part of the Bt horizon has chroma of 4 to 6.

Pershing Series

The Pershing series consists of very deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 9 percent.

Typical pedon of Pershing silt loam, 2 to 5 percent slopes; 2,658 feet north and 1,700 feet east of the southwest corner of sec. 21, T. 48 N., R. 23 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

BE—8 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

Bt—13 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; strong fine subangular blocky structure; firm; common fine roots; common distinct clay films and many faint silt coatings on faces of peds; moderately acid; clear smooth boundary.

Btg1—19 to 28 inches; grayish brown (10YR 5/2) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; strong medium blocky structure; firm; few fine roots; many faint clay films on faces of peds; moderately acid; clear smooth boundary.

Btg2—28 to 35 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; few black stains; common prominent clay films on faces of peds; moderately acid; gradual smooth boundary.

Btg3—35 to 41 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few very fine roots; few black stains; common prominent clay films on faces of peds; moderately acid; clear smooth boundary.

BCg—41 to 54 inches; light brownish gray (10YR 6/2) silty clay loam; many fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; common black stains; moderately acid; gradual smooth boundary.

Cg—54 to 60 inches; gray (10YR 6/1) silty clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; firm; few black stains; slightly acid.

The BE horizon and the upper part of the Bt horizon have value of 4 or 5 and chroma of 2 to 4. The lower part of the Bt horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 4.

Pershing silt loam, 5 to 9 percent slopes, eroded, has a lighter colored surface layer than is definitive for the Pershing series. This difference, however, does not significantly affect the use and management of the soil.

Sedalia Series

The Sedalia series consists of very deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in a thin mantle of loess and in the underlying cherty limestone residuum. Slopes range from 2 to 9 percent.

Typical pedon of Sedalia silt loam, 5 to 9 percent slopes, eroded; 3,100 feet south and 200 feet east of the northwest corner of sec. 25, T. 46 N., R. 22 W.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many very fine and fine roots; few chert pebbles; neutral; clear smooth boundary.

Bt1—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak very fine subangular blocky structure; firm; common very fine and fine roots; common distinct clay films on faces of peds; few chert pebbles; slightly acid; clear smooth boundary.

Bt2—11 to 17 inches; brown (10YR 5/3) silty clay; few fine faint grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; firm; common very fine and fine roots; many distinct clay films on faces of peds; few chert pebbles; strongly acid; clear smooth boundary.

Bt3—17 to 24 inches; yellowish brown (10YR 5/6) silty clay loam; common fine prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common very fine and fine roots; many prominent grayish brown (10YR 5/2) clay films on faces of peds; few chert pebbles; strongly acid; gradual smooth boundary.

2Bt4—24 to 30 inches; yellowish brown (10YR 5/6) gravelly silty clay loam; common fine prominent grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; firm; common very fine and fine roots; common prominent clay films on faces of peds; about 15 percent chert gravel; strongly acid; clear smooth boundary.

2Bt5—30 to 37 inches; dark yellowish brown (10YR 4/4) extremely gravelly clay loam; moderate fine subangular blocky structure; firm; common prominent clay films on faces of peds; about 65 percent chert gravel and 5 percent chert cobbles; slightly acid; clear smooth boundary.

3Bt6—37 to 47 inches; very pale brown (10YR 7/4)

clay; many medium prominent red (2.5YR 4/6) mottles; weak fine subangular blocky structure; very firm; common distinct clay films on faces of peds; about 5 percent chert gravel; slightly acid; clear smooth boundary.

3Bt7—47 to 60 inches; light gray (10YR 7/1) and yellow (10YR 7/6) clay; common fine prominent brownish yellow (10YR 6/8) mottles; weak fine subangular blocky structure; very firm; common faint clay films on faces of peds; about 5 percent chert gravel; slightly acid.

Depth to the gravelly layer ranges from 20 to 40 inches.

The A or Ap horizon has value and chroma of 2 or 3. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. The 2Bt and 3Bt horizons have mottled colors with hue of 5YR to 10YR, value of 4 to 7, and chroma of 1 to 8. The 2Bt horizon is the gravelly to extremely gravelly or cobbly to extremely cobbly analogs of silty clay loam and clay loam. The 3Bt horizon is clay, gravelly clay, or cobbly clay.

Tanglenook Series

The Tanglenook series consists of very deep, poorly drained, slowly permeable soils on high stream flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Tanglenook silt loam; 100 feet south and 1,000 feet west of the northeast corner of sec. 30, T. 48 N., R. 23 W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

A—6 to 11 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

AB—11 to 17 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; firm; common fine roots; neutral; clear smooth boundary.

Bt1—17 to 22 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; few fine distinct dark brown (10YR 3/3) mottles; weak fine subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; neutral; clear smooth boundary.

Bt2—22 to 30 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; few fine distinct dark yellowish brown (10YR 3/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; neutral; clear smooth boundary.

Btg1—30 to 40 inches; dark grayish brown (10YR 4/2) silty clay; many fine distinct yellowish brown (10YR 5/4) and common medium faint very dark gray (10YR 3/1) mottles; moderate fine prismatic structure; firm; few very fine roots; common prominent clay films on faces of peds; neutral; gradual smooth boundary.

Btg2—40 to 56 inches; grayish brown (10YR 5/2) silty clay; few fine faint light brownish gray (10YR 6/2) and few fine prominent yellowish brown (10YR 5/6) mottles; weak fine prismatic structure; firm; few distinct clay films on faces of peds; neutral; gradual smooth boundary.

Cg—56 to 60 inches; grayish brown (2.5Y 5/2) silty clay; common medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; common dark stains (oxides); neutral.

The mollic epipedon is 24 to 36 inches thick.

The A horizon is black (10YR 2/1) or very dark gray (10YR 3/1). The B horizon has hue of 10YR to 5Y. The Bt horizon typically is silty clay, but some pedons have subhorizons of silty clay loam with more than 35 percent clay. The average content of clay in the upper 20 inches of the argillic horizon is 40 to 50 percent, and sand content is 5 to 15 percent. The BCg horizon, if it occurs, or the upper part of the Cg horizon typically is similar to the Btg horizon, but some pedons have thin strata of silt loam or silty clay loam with a clay content ranging from 25 to 35 percent in the Cg horizon. The Cg horizon has hue of 2.5Y or 5Y and chroma of 1 or 2.

Wakenda Series

The Wakenda series consists of very deep, moderately well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 9 percent.

Typical pedon of Wakenda silt loam, 2 to 5 percent slopes; 1,660 feet north and 140 feet west of the southeast corner of sec. 11, T. 46 N., R. 20 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

A—7 to 11 inches; dark brown (10YR 3/3) silt loam, dark brown (10YR 4/3) dry; moderate very fine subangular blocky structure; friable; many fine roots; slightly acid; clear smooth boundary.

Bt1—11 to 18 inches; dark brown (10YR 3/3) silty clay loam, dark brown (10YR 4/3) dry; moderate fine subangular blocky structure; firm; common fine roots; common faint clay films on faces of peds;

slightly acid; gradual smooth boundary.

Bt2—18 to 27 inches; dark brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; common distinct clay films on faces of peds; slightly acid; clear smooth boundary.

Bt3—27 to 34 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; few fine roots; many prominent clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt4—34 to 42 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common prominent clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt5—42 to 54 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium prismatic structure; firm; few very fine roots; common distinct clay films on faces of peds; slightly acid; gradual smooth boundary.

BC—54 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium prismatic structure; firm; slightly acid.

The mollic epipedon ranges from 16 to 24 inches in thickness.

The A horizon has chroma of 2 or 3. The upper part of the Bt horizon has value of 3 to 5 and chroma of 3 or 4. The lower part of the Bt horizon and the BC horizon have value and chroma of 4 or 5. They are silty clay loam or clay loam.

Zook Series

The Zook series consists of very deep, poorly drained, slowly permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Zook silty clay loam; 1,370 feet north and 1,050 feet east of the southwest corner of sec. 20, T. 48 N., R. 23 W.

Ap—0 to 4 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

A1—4 to 10 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; firm; common fine roots; slightly acid; clear smooth boundary.

A2—10 to 19 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; few fine prominent dark brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; slightly acid; clear smooth boundary.

A3—19 to 40 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; few very fine roots; moderately acid; clear smooth boundary.

Bg—40 to 51 inches; gray (10YR 5/1) silty clay; few fine distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; firm; neutral; clear smooth boundary.

BCg—51 to 60 inches; gray (10YR 5/1) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; neutral.

The mollic epipedon ranges from 36 to 48 inches in thickness.

The A horizon has value of 2 or 3. The Bg horizon has value of 4 or 5.

Formation of the Soils

Soil is the product of soil-forming processes acting on materials accumulated or deposited by geologic action. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed to change the parent material into a soil that has distinct horizons. Some time is always required for the differentiation of soil horizons. Generally, a long time is required for the formation of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil formation are unknown.

Parent Material

Parent material is the matter in which soil is formed. The deposition or formation of this material is the first step in the development of a soil profile. The characteristics of the parent material determine the limits of chemical and mineralogical composition of the soil. In Pettis County, three kinds of parent material have contributed to the formation of the soils. These are residuum, or material weathered from bedrock; loess, or material deposited by the wind; and alluvium, or material deposited by water.

There are three major types of residuum in Pettis County—limestone and dolomitic limestone (both of which contain chert intrusions), shale, and sandstone. Eldon, Goss, and Moko soils formed in cherty limestone or dolomite residuum primarily of formations in the Mississippian and Ordovician geologic systems. Greenton soils formed in a thin mantle of loess and in the underlying limestone and shale material weathered from formations in the Pennsylvanian system, and Barco soils formed in sandstone residuum derived from similar formations.

Loess is silty material transported by the wind. It is the dominant parent material in the western part of the county and forms a thin mantle covering much of the rest of the county. Arispe, Haig, and Macksburg soils formed in loess.

In many places residual material and loess occur in combination. In times past, lag pebbles developed on the erosional surface of cherty residuum, which had weathered from limestone or dolomite. In the southeastern part of the county, this layer is dense and limits the depth to which roots can penetrate. A thin mantle of loess covers this material. Bahner, Friendly, Maplewood, and Paintbrush soils formed in these combined materials. In the northeastern part of the county, the erosional surface of the cherty residuum is not compacted and does not restrict root penetration. A thin mantle of loess also covers this material. Bluelick and Sedalia soils formed in these materials. In areas where the cherty residuum is not protected by the loess mantle, the chert generally is diffuse throughout the soil. Eldon and Goss soils formed in these areas.

Alluvium is material that was transported by water and deposited on nearly level flood plains. Because of its diverse origins and the varying speed of the flowing water, this material varies markedly in texture and mineralogical composition. Dockery and Otter soils formed in alluvium deposited by water that had sufficient flow and velocity to carry predominantly silt-sized particles. The finer textured Zook soils formed in clayey material that was deposited in slack-water areas. Dameron soils formed in cherty alluvium that was later covered by silty alluvium. Arbela, Tanglenook, Cotter, Lamine, and Nevin soils formed in older alluvium on high stream flood plains, where the soil-forming

processes have progressed further and a distinct subsoil has developed.

Plant and Animal Life

Plants and animals living on or in the soil are active in the soil-forming process. Plants furnish organic matter to the soil and bring up nutrients from underlying layers to the surface layer. When the plants die and decay, they contribute organic matter to the soil.

The kind of native vegetation has greatly influenced soil formation in Pettis County. The organic matter added to the soils under prairie grasses is largely the result of the yearly decomposition of plant material. Plant tops decompose at the surface, but a large part of the plant material consists of roots that decompose at various depths in the soil. Therefore, the soils that formed under prairie grasses have a thick, dark surface layer. Commonly, each acre of these soils may contain as much as 50 tons of organic matter in the plow layer. Soils that formed under prairie vegetation tend to have a high pH and a high base saturation. These conditions slow the decomposition of the organic matter. The development of a thick, dark layer occurs relatively quickly in geologic terms, perhaps within a period of about 400 years *(4)*. Greenton, Haig, and Hartwell soils are examples of soils that formed under prairie grasses.

Soils that formed under woodland vegetation have a lower content of organic matter than prairie soils. In areas of woodland the organic matter is mostly the result of the decomposition of leaves and twigs on the surface. An acid environment is produced in which weathering of the mineral material and decomposition of the organic matter are accelerated. Thus the soils that formed under woodland vegetation have a thin, dark surface layer and a well developed subsoil. Bluelick and Lamine soils are examples.

Several soils in Pettis County developed in "tension zones," where the type of vegetative cover alternated between forest and prairie depending on changes in climate. Such soils have properties intermediate between those of soils that formed under grass and those of soils that formed under trees. They are generally known as "transitional" soils. Pembroke and Pershing soils are examples.

Worms, insects, burrowing animals, large animals, and humans affect and disturb the soil. In an acre of soil, for example, earthworms may pass as much as 15 tons of dry earth through their bodies each year *(3)*. The digestive enzymes and grinding action contribute significantly to the mixing and aeration of the soil, the breakdown of mineral and organic matter, and the increased availability of plant nutrients. Actinomycetes, bacteria, and fungi contribute more to the formation of soils than do animals, and under favorable conditions they may make up as much as 2 tons of the mass in the plow layer of each acre *(3)*. These micro-organisms cause the decomposition of organic materials, improve tilth, and fix nitrogen in the soils. The population of soil organisms is directly related to the rate of decomposition of organic matter in the soil. Differences in vegetation influence the kinds and populations of organisms and their activity.

Human activity has greatly influenced the soils in this county. Major alterations in the soils have resulted from changes in vegetation, drainage, accelerated erosion, and urban buildup. Row crops have replaced many of the native grasses and forested areas. Intensive cultivation and overgrazing have resulted in severe erosion in many areas. In some places all of the productive topsoil—as much as 16 inches—has been lost. Most of the cropland is still eroding at a rate that exceeds what is considered tolerable for sustained production. Many acres of prime farmland have been converted to urban uses, and thus less productive soils have been farmed more intensively. The runoff rate is also increased in these urban areas because the soils are covered by materials that prevent the infiltration of water. The increased runoff results in accelerated erosion.

Climate

Climate has been an important factor in soil formation in the survey area. Geologic erosion, the kinds of plant and animal life, and the parent materials of the soils have been directly affected by the climate.

Soil formation was greatly influenced by the climatic changes that produced glaciation. Thousands of years of cold temperatures alternating with moderate temperatures apparently produced the glaciers that moved into northern Missouri *(4)*. Warmer weather patterns then caused the glaciers to recede. The glacial meltwater made the atmosphere more humid and volatile. The unprotected bedload from the glacier was easily blown by relentless winds generated by the climate change. The windblown material was carried to the southeast, gradually depositing the mantle of loess that now covers much of the county. The climate at that time was cool and moist, and the native vegetation was woodland. A subsequent period of significantly lower rainfall resulted in the development of extensive prairies. The present climate favors encroachment of forests. Before the area was permanently settled, however, wildfire played a crucial role in maintaining prairies by killing woody seedlings and stimulating the growth of fire-tolerant warm-season grasses.

In addition to influencing native vegetation, the

climate has a direct physical influence on the soil. The present subhumid, midcontinental climate has distinct temperature fluctuations with the seasons. Alternating cycles of freezing and thawing result in the gradual disintegration of exposed bedrock. Any crevice that is large enough for water to enter is subject to more fracture when the water freezes. South-facing slopes are subject to more of these cycles because sunlight warms them more during the day than corresponding north-facing slopes.

Moisture deficits in the summer contribute to cracking, which is instrumental in the development of argillic horizons in the subsoil. Subsequent rainfall disperses clay-sized particles in the upper layers of the soil, which move down into the cracks along with the percolating water. As the water is absorbed into the dry soil along the cracks, the clay particles are left on the surface of the cracks, creating clay films that define the aggregation of the soil and gradually increase the content of clay. Eventually much of the clay leaves the surface layer and migrates into the subsoil through this process. The degree and depth of this translocation are indicators of the age of the soil. All of the upland soils in Pettis County show evidence of this clay movement.

Surplus moisture in the spring and late in the fall creates zones of saturation in some soils and influences the color of the subsoil. In general, gray colors are the result of the reduction of iron in the soil, which is indicative of wetness. Conversely, brown or red colors are associated with oxidation in the soil, indicating free movement of water through the soil. Some soils, such as those of the Tanglenook series, have a water table that is continuous below its upper boundary. Other soils, such as those of the Arispe series, have a perched water table, or a noncontinuous zone of saturation that occurs because subsoil horizons hold the water up temporarily. Some soils that are saturated for long periods support indicator plant species, such as smartweed, various sedges, silver maple, or cottonwood. This saturation affects the suitability of a soil for some crops that are sensitive to wetness, such as alfalfa. It also influences the effective length of the growing season in areas where cultivation and seedbed preparation are delayed by the seasonal wetness.

Pettis County is on the border of two distinct temperature zones. The western part of the county is on the edge of an area that has higher temperatures, or a thermic temperature regime (more than 15 degrees C), and the rest of the county is part of an area that has somewhat lower temperatures, or a mesic temperature regime (less than 15 degrees C). The higher temperatures generally are conducive to prairies, and the lower temperatures are conducive to woodland.

Relief

Relief influences soil formation mostly through its effect on drainage, runoff, erosion, and exposure to sun and wind.

The amount of water entering and passing through the soil depends upon the steepness and shape of the slope, the permeability of the soil material, and the amount and intensity of rainfall. On steep soils, runoff is rapid and very little water passes through the soil. Consequently, distinct horizons develop slowly. On gently sloping or nearly level upland soils, however, runoff is slow and most of the water passes through the soil. As a result, these soils show maximum profile development. Because of runoff from adjacent hillsides, soils on foot slopes receive an extra increment of water in addition to direct rainfall.

Concave areas are generally wetter than other areas. As runoff converges in these areas, the water flow is concentrated and the volume that goes over and through the soil is greater. Arispe soils and some Hartwell soils are in such positions on the landscape.

Convex areas are drier because the divergent pattern of water flow disperses the water, resulting in a smaller volume going over and through the soil. Such areas are usually well drained or moderately well drained. Wakenda soils and some Pembroke soils are in convex areas.

South-facing slopes receive more direct sunlight than north-facing slopes, which contributes to faster warming and drying of the soil and thus to differences in native vegetation. These slopes are more affected by freezing and thawing cycles than north-facing slopes, which tend to stay frozen longer. This increased freezing and thawing has caused deeper weathering of the soils, and the accelerated geologic erosion results in flatter slopes in these positions. The more direct sunlight also makes these sites somewhat drier. The drier conditions favor prairie vegetation.

Time

The degree of profile development reflects the length of time the parent material has been in place and subjected to weathering processes. Young soils show very little profile development or horizon differentiation. Old soils show the effects of leaching and the movement of clay and have distinct horizons.

The youngest soils in Pettis County are those that formed in alluvium. Dockery soils, for example, do not show any profile development. Alluvial material is added to the surface nearly every year. Arbela, Tanglenook, Cotter, Lamine, and Nevin soils are the oldest alluvial soils. They are on high stream flood plains and show moderate profile development.

The oldest soils in the survey area formed in cherty residuum on upland side slopes. Long periods of time were necessary for the limestone or dolomite matrix to be dissolved and for the cherty residuum to accumulate. Eldon and Goss soils formed in this material. The soils that formed in loess, such as Arispe and Macksburg soils, show distinct horizon development, but the translocation of clay has not occurred as deeply in the profile as in the older Goss and Eldon soils.

Many areas reflect dual chronologies. In Bahner, Friendly, Maplewood, and Paintbrush soils, for example, the underlying material is relatively old and has strongly expressed horizons. This material is covered by younger loess, which has in turn developed horizons of its own.

References

(1) American Association of State Highway and Transportation Officials. 1986. Standard specifications for highway materials and methods of sampling and testing. Ed. 14, 2 vols.

(2) American Society for Testing and Materials. 1993. Standard classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Buckman, Harry O., and Nyle C. Brady. 1971. The nature and properties of soils. Ed. 7.

(4) Buol, S.W., F.D. Hole, and R.J. McCracken. 1980. Soil genesis and classification. Ed. 2.

(5) Krusekopf, H.H., and R.F. Rogers. 1916. Soil survey of Pettis County, Missouri. U.S. Dep. Agric., Bur. of Soils.

(6) Missouri Department of Conservation. 1989. 1989 spring turkey harvest.

(7) Missouri Division of Community and Economic Development. 1984. Community profile—Sedalia, Missouri, Pettis County.

(8) Nagel, Werner, ed. and comp. 1970. Conservation contrasts. Missouri Dep. Conserv.

(9) United States Department of Agriculture, Soil Conservation Service. National resources inventory. (Available in the State Office of the Soil Conservation Service at Columbia, Missouri)

(10) United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210.

(11) United States Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436.

(12) United States Department of Agriculture, Soil Conservation Service. 1993. Soil survey manual. U.S. Dep. Agric. Handb. 18.

(13) United States Department of Commerce, Bureau of the Census. 1989. 1987 census of agriculture, advance county report, Pettis County, Missouri. AC87-A-29-159(A).

(14) Work Projects Administration. 1986. The WPA guide to 1930's Missouri.

Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Cement rock. Shaly limestone used in the manufacture of cement.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches

along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to bedrock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed

from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone,

slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range in moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 drawbar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or

management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Very gently sloping	1 to 3 percent
Gently sloping	2 to 5 percent
Moderately sloping	5 to 9 percent
Strongly sloping	9 to 14 percent
Moderately steep	14 to 20 percent
Steep	20 to 35 percent
Very steep	more than 35 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediments of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB,

or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-88 at Sedalia, Missouri)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	38.5	18.0	28.3	67	-10	16	1.39	0.44	2.16	4	4.5
February----	44.1	23.1	33.6	72	0	25	1.64	.68	2.45	4	4.3
March-------	54.5	32.2	43.4	83	5	70	2.91	1.41	4.20	6	3.3
April-------	67.5	43.9	55.7	88	23	218	3.85	1.96	5.48	7	.6
May---------	76.4	53.5	65.0	90	34	471	4.62	2.95	6.13	8	.0
June--------	84.6	62.4	73.5	96	46	705	4.88	1.84	7.41	7	.0
July--------	90.1	66.7	78.4	102	50	880	4.06	1.28	6.32	6	.0
August------	88.6	64.4	76.5	101	48	822	3.82	1.30	5.88	6	.0
September---	81.3	56.6	69.0	97	37	570	4.03	1.41	6.19	6	.0
October-----	69.8	45.2	57.5	90	25	275	3.89	1.40	5.95	6	.0
November----	54.9	33.7	44.3	79	11	47	2.59	.69	4.10	5	1.5
December----	42.9	24.1	33.5	70	-11	23	2.04	.86	3.04	5	2.8
Yearly:											
Average---	66.1	43.7	54.9	---	---	---	---	---	---	---	---
Extreme---	---	---	---	104	-11	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,122	39.72	30.40	47.86	70	17.0

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-88 at Sedalia, Missouri)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 5	Apr. 20	Apr. 29
2 years in 10 later than--	Apr. 1	Apr. 16	Apr. 24
5 years in 10 later than--	Mar. 23	Apr. 7	Apr. 15
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 24	Oct. 13	Oct. 4
2 years in 10 earlier than--	Oct. 29	Oct. 19	Oct. 8
5 years in 10 earlier than--	Nov. 8	Oct. 30	Oct. 17

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-88 at Sedalia, Missouri)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	206	184	165
8 years in 10	214	191	172
5 years in 10	229	205	185
2 years in 10	244	220	198
1 year in 10	252	227	205

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
10A	Hartwell silt loam, 0 to 2 percent slopes	18,900	4.3
10B2	Hartwell silt loam, 1 to 3 percent slopes, eroded	45,000	10.2
11	Hartwell silt loam, foot slopes, 0 to 1 percent slopes	4,750	1.1
12	Haig silt loam	1,300	0.3
15B	Bluelick silt loam, 2 to 5 percent slopes	530	0.1
15C	Bluelick silt loam, 5 to 9 percent slopes	13,700	3.1
15D2	Bluelick silt loam, 9 to 16 percent slopes, eroded	7,700	1.8
17B	Pembroke silt loam, 2 to 5 percent slopes	6,300	1.4
17C	Pembroke silt loam, 5 to 9 percent slopes	12,600	2.9
17D	Pembroke silt loam, 9 to 16 percent slopes	434	0.1
20B	Pershing silt loam, 2 to 5 percent slopes	10,100	2.3
20B2	Pershing silt loam, 2 to 5 percent slopes, eroded	4,300	1.0
20C2	Pershing silt loam, 5 to 9 percent slopes, eroded	7,600	1.7
21B2	Pershing silt loam, foot slopes, 2 to 5 percent slopes, eroded	6,500	1.5
23B	Macksburg silt loam, 1 to 5 percent slopes	35,000	8.0
24B2	Arispe silt loam, 2 to 5 percent slopes, eroded	70,500	16.1
24C2	Arispe silt loam, 5 to 9 percent slopes, eroded	3,800	0.9
28B	Greenton silt loam, foot slopes, 2 to 5 percent slopes	4,250	1.0
28B2	Greenton silt loam, 2 to 5 percent slopes, eroded	8,100	1.8
28C2	Greenton silt loam, bedrock substratum, 5 to 9 percent slopes, eroded	12,100	2.8
28C3	Greenton silty clay loam, bedrock substratum, 5 to 9 percent slopes, severely eroded	550	0.1
28D2	Greenton silty clay loam, bedrock substratum, 9 to 14 percent slopes, eroded	740	0.2
31	Otter silt loam	12,300	2.8
32	Tanglenook silt loam	2,900	0.7
33	Dockery silt loam	18,100	4.1
34	Arbela silt loam	1,800	0.4
38	Zook silty clay loam	231	0.1
40	Lamine silt loam	7,400	1.7
42	Dameron silt loam	5,400	1.2
43	Nevin silt loam	2,750	0.6
46	Cotter silt loam	408	0.1
53B	Friendly silt loam, 1 to 3 percent slopes	3,600	0.8
53B2	Friendly silt loam, 1 to 4 percent slopes, eroded	8,300	1.9
54B	Paintbrush silt loam, 2 to 5 percent slopes	4,400	1.0
54B2	Paintbrush silt loam, 2 to 5 percent slopes, eroded	5,900	1.3
54C	Paintbrush silt loam, 5 to 9 percent slopes	13,100	3.0
55B	Bahner silt loam, 2 to 5 percent slopes	1,050	0.2
55C	Bahner silt loam, 5 to 9 percent slopes	5,500	1.3
58B2	Sedalia silty clay loam, 2 to 5 percent slopes, eroded	1,400	0.3
58C2	Sedalia silt loam, 5 to 9 percent slopes, eroded	1,700	0.4
62B2	Maplewood silt loam, 2 to 5 percent slopes, eroded	14,500	3.3
75C	Barco loam, 5 to 9 percent slopes	1,350	0.3
75D	Barco loam, 9 to 14 percent slopes	960	0.2
75F	Barco loam, 14 to 35 percent slopes, very stony	560	0.1
77B	Wakenda silt loam, 2 to 5 percent slopes	3,600	0.8
77C	Wakenda silt loam, 5 to 9 percent slopes	1,550	0.4
81C	Eldon gravelly silt loam, 3 to 9 percent slopes	13,300	3.0
81D	Eldon gravelly silt loam, 9 to 14 percent slopes	12,900	2.9
83D	Moko very channery silt loam, 5 to 14 percent slopes	485	0.1
83F	Moko very channery loam, 14 to 50 percent slopes	1,600	0.4
85F	Goss very cobbly silt loam, 14 to 35 percent slopes	16,800	3.8
99	Pits, quarries	570	0.1
	Water areas more than 40 acres in size	192	*
	Total	439,360	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
10A	Hartwell silt loam, 0 to 2 percent slopes (where drained)
10B2	Hartwell silt loam, 1 to 3 percent slopes, eroded (where drained)
11	Hartwell silt loam, foot slopes, 0 to 1 percent slopes (where drained)
12	Haig silt loam (where drained)
15B	Bluelick silt loam, 2 to 5 percent slopes
17B	Pembroke silt loam, 2 to 5 percent slopes
20B	Pershing silt loam, 2 to 5 percent slopes
20B2	Pershing silt loam, 2 to 5 percent slopes, eroded
21B2	Pershing silt loam, foot slopes, 2 to 5 percent slopes, eroded
23B	Macksburg silt loam, 1 to 5 percent slopes
24B2	Arispe silt loam, 2 to 5 percent slopes, eroded
28B	Greenton silt loam, foot slopes, 2 to 5 percent slopes
28B2	Greenton silt loam, 2 to 5 percent slopes, eroded
31	Otter silt loam (where drained and either protected from flooding or not frequently flooded during the growing season)
32	Tanglenook silt loam (where drained)
33	Dockery silt loam (where protected from flooding or not frequently flooded during the growing season)
34	Arbela silt loam (where drained)
38	Zook silty clay loam (where drained and either protected from flooding or not frequently flooded during the growing season)
40	Lamine silt loam (where drained)
42	Dameron silt loam (where protected from flooding or not frequently flooded during the growing season)
43	Nevin silt loam
46	Cotter silt loam
53B	Friendly silt loam, 1 to 3 percent slopes
53B2	Friendly silt loam, 1 to 4 percent slopes, eroded
54B	Paintbrush silt loam, 2 to 5 percent slopes
54B2	Paintbrush silt loam, 2 to 5 percent slopes, eroded
55B	Bahner silt loam, 2 to 5 percent slopes
58B2	Sedalia silty clay loam, 2 to 5 percent slopes, eroded
62B2	Maplewood silt loam, 2 to 5 percent slopes, eroded
77B	Wakenda silt loam, 2 to 5 percent slopes

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Grain sorghum	Winter wheat	Orchard-grass-red clover hay	Alfalfa hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	Tons	AUM*
10A------------- Hartwell	IIe	102	37	89	41	3.8	---	5.7
10B2------------ Hartwell	IIe	96	35	85	39	3.6	---	5.4
11-------------- Hartwell	IIw	95	35	84	38	3.5	---	5.2
12-------------- Haig	IIw	108	40	94	44	4.0	---	6.0
15B------------- Bluelick	IIe	94	35	83	38	3.5	3.0	5.2
15C------------- Bluelick	IIIe	87	32	76	36	3.3	2.9	5.0
15D2------------ Bluelick	IVe	75	27	66	30	3.0	2.8	4.5
17B------------- Pembroke	IIe	111	41	96	45	4.1	3.7	6.2
17C------------- Pembroke	IIIe	102	37	89	41	3.8	3.5	5.7
17D------------- Pembroke	IVe	92	34	81	37	3.4	3.2	5.1
20B------------- Pershing	IIIe	97	36	85	39	3.6	2.8	5.4
20B2------------ Pershing	IIIe	92	34	81	37	3.4	2.6	5.1
20C2------------ Pershing	IIIe	84	31	73	34	3.1	2.4	4.7
21B2------------ Pershing	IIIe	93	35	82	38	3.4	2.7	5.1
23B------------- Macksburg	IIe	114	42	99	47	4.0	2.9	6.0
24B2------------ Arispe	IIe	97	36	85	39	3.6	2.7	5.4
24C2------------ Arispe	IIIe	89	32	78	36	3.3	2.5	5.0
28B------------- Greenton	IIe	102	38	89	41	3.8	3.5	5.7
28B2------------ Greenton	IIIe	95	36	85	39	3.5	3.3	5.2

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Grain sorghum	Winter wheat	Orchard-grass-red clover hay	Alfalfa hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	Tons	AUM*
28C2------------ Greenton	IIIe	89	32	77	36	3.3	3.0	5.0
28C3------------ Greenton	IVe	84	31	73	34	3.1	2.8	4.7
28D2------------ Greenton	VIe	---	---	---	---	2.9	2.6	4.4
31-------------- Otter	IIIw	94	35	83	38	3.5	---	5.2
32-------------- Tanglenook	IIw	102	37	89	41	3.8	---	5.7
33-------------- Dockery	IIIw	102	37	89	41	3.8	---	5.7
34-------------- Arbela	IIw	102	37	88	41	3.8	---	5.7
38-------------- Zook	IIIw	69	26	61	28	2.6	---	3.9
40-------------- Lamine	IIIw	81	30	71	33	3.0	---	4.5
42-------------- Dameron	IIw	75	27	66	30	2.8	2.6	4.2
43-------------- Nevin	IIw	123	46	108	55	4.6	3.7	6.9
46-------------- Cotter	IIw	114	42	98	47	4.0	3.5	6.0
53B------------- Friendly	IIe	75	27	66	30	2.8	---	4.2
53B2------------ Friendly	IIIe	73	34	78	37	2.6	---	5.1
54B------------- Paintbrush	IIe	87	32	76	35	3.2	2.9	4.8
54B2------------ Paintbrush	IIIe	73	27	64	29	2.7	2.3	4.0
54C------------- Paintbrush	IIIe	78	29	69	32	2.9	2.5	4.4
55B------------- Bahner	IIe	84	31	73	34	3.1	2.9	4.7
55C------------- Bahner	IIIe	75	27	66	30	2.8	2.5	4.2
58B2------------ Sedalia	IIIe	94	35	83	37	3.4	---	5.2

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Grain sorghum	Winter wheat	Orchard-grass-red clover hay	Alfalfa hay	Tall fescue
		Bu	Bu	Bu	Bu	Tons	Tons	AUM*
58C2------------ Sedalia	IIIe	87	31	74	34	3.2	---	4.8
62B2------------ Maplewood	IIIe	77	28	67	31	2.9	---	4.4
75C------------- Barco	IIIe	69	26	61	28	2.6	2.4	3.9
75D------------- Barco	IVe	60	24	52	24	2.3	2.2	3.5
75F------------- Barco	VIe	---	---	---	---	2.0	2.0	3.0
77B------------- Wakenda	IIe	127	47	110	52	4.8	4.0	7.2
77C------------- Wakenda	IIIe	119	44	104	48	4.5	3.5	6.8
81C------------- Eldon	IVe	62	22	54	25	2.3	2.3	3.5
81D------------- Eldon	VIe	---	---	---	---	1.9	1.9	2.1
83D------------- Moko	VIs	---	---	---	---	---	---	3.0
83F------------- Moko	VIIs	---	---	---	---	---	---	1.5
85F------------- Goss	VIIe	---	---	---	---	---	---	3.0
99. Pits								

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
15B, 15C, 15D2-- Bluelick	3A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Black oak-----------	60 65 62	45 45 45	White oak, green ash, black walnut.
17B, 17C, 17D--- Pembroke	3A	Slight	Slight	Slight	Slight	Northern red oak---- Virginia pine------- Sugar maple--------- Hickory------------- Black walnut-------- Black cherry-------- White ash----------- White oak-----------	65 --- --- --- --- --- --- ---	45 --- --- --- --- --- --- ---	Black walnut, white ash, eastern white pine, northern red oak, white oak.
20B, 20B2, 20C2, 21B2----------- Pershing	3C	Slight	Slight	Severe	Severe	White oak----------- Pin oak------------- Shingle oak--------- Hackberry-----------	55 --- --- ---	45 --- --- ---	Eastern white pine, red pine.
31-------------- Otter	3W	Slight	Severe	Moderate	Moderate	Silver maple--------	94	48	Silver maple, green ash, pin oak, eastern cottonwood.
32-------------- Tanglenook	2W	Slight	Severe	Moderate	Moderate	Silver maple-------- Eastern cottonwood--	80 90	36 108	Silver maple, eastern cottonwood, American sycamore, hackberry, green ash, pin oak.
33-------------- Dockery	4A	Slight	Moderate	Slight	Slight	Pin oak-------------	76	60	Pin oak, pecan, eastern cottonwood.
40-------------- Lamine	7W	Slight	Moderate	Moderate	Moderate	Eastern cottonwood-- Pin oak------------- Pecan--------------- Green ash----------- Hackberry-----------	90 --- --- --- ---	108 --- --- --- ---	Pecan, green ash, cottonwood, pin oak.
42-------------- Dameron	5A	Slight	Slight	Slight	Slight	Green ash----------- Black walnut-------- American sycamore--- White oak-----------	70 72 --- ---	35 35 --- ---	Black walnut.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
46-------------- Cotter	9A	Slight	Slight	Slight	Slight	Eastern cottonwood--	100	105	Eastern cottonwood, black walnut.
53B, 53B2------- Friendly	2W	Slight	Moderate	Slight	Slight	White oak-----------	50	36	Black oak, pin oak.
						Post oak------------	---	--	
						Black oak-----------	---	--	
						Pin oak-------------	---	--	
54B, 54B2, 54C-- Paintbrush	3D	Slight	Slight	Slight	Moderate	White oak-----------	60	45	Black oak.
						Post oak------------	---	--	
						Black oak-----------	---	--	
						Pin oak-------------	---	--	
55B, 55C-------- Bahner	3A	Slight	Slight	Slight	Slight	White oak-----------	65	51	White oak, black oak.
						Post oak------------	---	--	
						Black oak-----------	---	--	
						Pin oak-------------	---	--	
62B2------------ Maplewood	3W	Slight	Moderate	Slight	Slight	White oak-----------	60	45	White oak, black oak.
						Post oak------------	---	--	
						Black oak-----------	---	--	
						Pin oak-------------	---	--	
75F------------- Barco	3R	Moderate	Moderate	Moderate	Slight	White oak-----------	55	41	White oak.
						Black oak-----------	---	--	
83D------------- Moko	2X	Moderate	Moderate	Moderate	Severe	Eastern redcedar----	30	33	Eastern redcedar.
83F------------- Moko	2R	Moderate	Moderate	Moderate	Severe	Eastern redcedar----	30	33	Eastern redcedar.
85F------------- Goss	3R	Moderate	Moderate	Slight	Slight	White oak-----------	60	45	White oak, black oak.
						Post oak------------	---	--	
						Blackjack oak-------	---	--	
						Black oak-----------	---	--	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
10A, 10B2, 11 Hartwell	Lilac	Amur maple, Amur honeysuckle, gray dogwood, Manchurian crabapple.	Eastern redcedar, hackberry, Austrian pine, green ash, Russian-olive.	Honeylocust	---
12 Haig	Redosier dogwood	Common chokecherry, American plum.	Eastern redcedar, hackberry.	Austrian pine, honeylocust, green ash, golden willow, silver maple, northern red oak.	Eastern cottonwood.
15B, 15C, 15D2 Bluelick	---	Amur honeysuckle, Amur maple, gray dogwood, lilac.	Eastern redcedar, hackberry, Russian-olive.	Norway spruce, eastern white pine, pin oak, green ash, honeylocust.	---
17B, 17C, 17D Pembroke	---	Amur honeysuckle, lilac, Amur maple, gray dogwood.	Eastern redcedar, Russian-olive, hackberry.	Norway spruce, green ash, honeylocust, pin oak, eastern white pine.	---
20B, 20B2, 20C2, 21B2 Pershing	Lilac	Siberian peashrub, Manchurian crabapple, gray dogwood, Amur honeysuckle.	Eastern redcedar, hackberry, Russian-olive, Austrian pine, green ash.	Honeylocust	---
23B Macksburg	---	Amur honeysuckle, lilac, gray dogwood, Amur maple.	Eastern redcedar	Austrian pine, eastern white pine, honeylocust, hackberry, green ash, pin oak.	Eastern cottonwood.
24B2, 24C2 Arispe	---	Lilac, Amur honeysuckle, Amur maple, gray dogwood.	Eastern redcedar, green ash, bur oak, Russian-olive, hackberry.	Austrian pine, eastern white pine, honeylocust.	---
28B, 28B2 Greenton	Lilac	Amur honeysuckle, gray dogwood, Manchurian crabapple, Siberian peashrub.	Eastern redcedar, Austrian pine, hackberry, green ash, Russian-olive.	Honeylocust	---
28C2, 28C3, 28D2 Greenton	Lilac	Amur maple, Amur honeysuckle, Manchurian crabapple, gray dogwood.	Austrian pine, black locust, hackberry, eastern redcedar, green ash.	Eastern white pine	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
31 Otter	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
32 Tanglenook	---	Amur honeysuckle, American plum, plum.	Austrian pine	Eastern white pine, green ash.	Pin oak.
33 Dockery	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce	Eastern white pine, pin oak.
34 Arbela	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
38 Zook	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, hackberry.	Honeylocust, golden willow, green ash, northern red oak, silver maple, Austrian pine.	Eastern cottonwood.
40 Lamine	Redosier dogwood	American plum	Red mulberry, eastern redcedar.	Green ash, honeylocust, pecan.	Eastern cottonwood.
42 Dameron	---	Amur honeysuckle, lilac, Amur maple, gray dogwood.	Eastern redcedar	Austrian pine, hackberry, green ash, pin oak, honeylocust, eastern white pine.	Eastern cottonwood.
43 Nevin	---	Amur honeysuckle, lilac, gray dogwood, Amur maple.	Eastern redcedar	Austrian pine, eastern white pine, honeylocust, hackberry, green ash, pin oak.	Eastern cottonwood.
46 Cotter	---	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
53B, 53B2. Friendly	Amur honeysuckle, fragrant sumac, lilac.	Gray dogwood	Russian-olive, Austrian pine, eastern redcedar, bur oak, hackberry, green ash, honeylocust.	Siberian elm	---
54B, 54B2, 54C. Paintbrush	Amur honeysuckle, fragrant sumac, lilac.	Gray dogwood	Russian-olive, Austrian pine, eastern redcedar, bur oak, hackberry, green ash, honeylocust.	Siberian elm	---
55B, 55C. Bahner	Amur honeysuckle, fragrant sumac, lilac.	Gray dogwood	Russian-olive, Austrian pine, eastern redcedar, bur oak, hackberry, green ash, honeylocust.	Siberian elm	---
58B2, 58C2. Sedalia	Amur honeysuckle, fragrant sumac, lilac.	Gray dogwood	Russian-olive, Austrian pine, eastern redcedar, bur oak, hackberry, green ash, honeylocust.	Siberian elm	---
62B2. Maplewood	Amur honeysuckle, fragrant sumac, lilac.	Gray dogwood	Russian-olive, Austrian pine, eastern redcedar, bur oak, hackberry, green ash, honeylocust.	Siberian elm	---
75C, 75D. Barco	Amur honeysuckle, lilac, fragrant sumac.	Gray dogwood	Green ash, eastern redcedar, bur oak, Russian-olive, Austrian pine, hackberry.	Siberian elm, honeylocust.	---
75F. Barco	Lilac, fragrant sumac.	Gray dogwood	Eastern redcedar, green ash, Austrian pine, hackberry, pin oak.	---	---
77B, 77C. Wakenda	---	Amur maple, gray dogwood, lilac.	Amur honeysuckle, eastern redcedar, bur oak, hackberry, green ash, Russian-olive.	Austrian pine, eastern white pine, honeylocust.	---
81C, 81D. Eldon	Amur honeysuckle, lilac, fragrant sumac.	Gray dogwood	Green ash, hackberry, honeylocust, bur oak, Russian-olive, Austrian pine, eastern redcedar.	Siberian elm	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
83D, 83F. Moko					
85F. Goss	Siberian peashrub	Lilac, Amur honeysuckle, gray dogwood, eastern redcedar, Washington hawthorn, radiant crabapple.	Austrian pine, eastern white pine, red pine.	---	---
99. Pits					

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
10A, 10B2, 11 Hartwell	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
12 Haig	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
15B Bluelick	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
15C Bluelick	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
15D2 Bluelick	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
17B Pembroke	Slight	Slight	Moderate: slope.	Slight	Slight.
17C Pembroke	Slight	Slight	Severe: slope.	Slight	Slight.
17D Pembroke	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
20B, 20B2 Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
20C2 Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
21B2 Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
23B Macksburg	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
24B2 Arispe	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
24C2 Arispe	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
28B, 28B2 Greenton	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
28C2, 28C3: Greenton	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness.
28D2: Greenton	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
31: Otter	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
32: Tanglenook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
33: Dockery	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
34: Arbela	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
38: Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
40: Lamine	Severe: flooding, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, flooding.
42: Dameron	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
43: Nevin	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
46: Cotter	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
53B, 53B2: Friendly	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
54B, 54B2: Paintbrush	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: small stones, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, droughty.
54C: Paintbrush	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness, droughty.
55B: Bahner	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: erodes easily.	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
55C------------------- Bahner	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
58B2------------------ Sedalia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: small stones, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
58C2------------------ Sedalia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness.
62B2------------------ Maplewood	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, droughty.
75C------------------- Barco	Slight----------	Slight----------	Severe: slope.	Slight----------	Moderate: depth to rock.
75D------------------- Barco	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope, depth to rock.
75F------------------- Barco	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
77B------------------- Wakenda	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
77C------------------- Wakenda	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
81C------------------- Eldon	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight----------	Moderate: small stones, large stones.
81D------------------- Eldon	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight----------	Moderate: small stones, large stones, slope.
83D------------------- Moko	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones.	Severe: large stones, droughty.
83F------------------- Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope.	Severe: large stones, droughty, slope.
85F------------------- Goss	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: small stones, large stones, droughty.
99. Pits					

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
10A----------------- Hartwell	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
10B2---------------- Hartwell	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
11------------------ Hartwell	Fair	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
12------------------ Haig	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
15B, 15C, 15D2------ Bluelick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
17B, 17C------------ Pembroke	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
17D----------------- Pembroke	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
20B, 20B2----------- Pershing	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
20C2---------------- Pershing	Fair	Good	Good	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
21B2---------------- Pershing	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
23B----------------- Macksburg	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
24B2, 24C2---------- Arispe	Good	Good	Good	Good	Good	Very poor.	Poor	Good	Good	Very poor.
28B, 28B2----------- Greenton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
28C2, 28C3---------- Greenton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
28D2---------------- Greenton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
31------------------ Otter	Poor	Poor	Good	Fair	Fair	Good	Good	Poor	Fair	Good.
32------------------ Tanglenook	Poor	Fair	Poor	Fair	Poor	Good	Good	Poor	Fair	Good.
33------------------ Dockery	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
34------------------ Arbela	Poor	Fair	Poor	Good	Good	Fair	Fair	Poor	Fair	Fair.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
38----------------- Zook	Very poor.	Poor	Poor	Fair	Poor	Good	Good	Poor	Fair	Good.
40----------------- Lamine	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
42----------------- Dameron	Good	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
43----------------- Nevin	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
46----------------- Cotter	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
53B, 53B2---------- Friendly	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
54B, 54B2, 54C----- Paintbrush	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
55B, 55C----------- Bahner	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
58B2, 58C2--------- Sedalia	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
62B2--------------- Maplewood	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
75C, 75D----------- Barco	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
75F---------------- Barco	Poor	Poor	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
77B---------------- Wakenda	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
77C---------------- Wakenda	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
81C, 81D----------- Eldon	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
83D, 83F----------- Moko	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
85F---------------- Goss	Poor	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
99. Pits										

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
10A, 10B2, 11----- Hartwell	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
12---------------- Haig	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
15B--------------- Bluelick	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
15C--------------- Bluelick	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
15D2-------------- Bluelick	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
17B--------------- Pembroke	Moderate: too clayey.	Slight---------	Moderate: shrink-swell.	Slight---------	Severe: low strength.	Slight.
17C--------------- Pembroke	Moderate: too clayey.	Slight---------	Moderate: shrink-swell.	Moderate: slope.	Severe: low strength.	Slight.
17D--------------- Pembroke	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
20B, 20B2, 20C2, 21B2------------- Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
23B--------------- Macksburg	Severe: wetness.	Severe: shrink-swell.	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
24B2, 24C2-------- Arispe	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
28B, 28B2--------- Greenton	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
28C2, 28C3-------- Greenton	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
28D2 Greenton	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
31 Otter	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
32 Tanglenook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
33 Dockery	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.
34 Arbela	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
38 Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, flooding.
40 Lamine	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Moderate: wetness, flooding.
42 Dameron	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
43 Nevin	Severe: excess humus, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
46 Cotter	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
53B, 53B2 Friendly	Severe: wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness, droughty.
54B, 54B2, 54C Paintbrush	Severe: wetness.	Moderate: wetness, large stones.	Severe: wetness.	Moderate: wetness, large stones, slope.	Moderate: wetness, frost action, large stones.	Moderate: wetness, droughty.
55B Bahner	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength.	Slight.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
55C Bahner	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
58B2, 58C2 Sedalia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
62B2 Maplewood	Severe: wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Moderate: low strength, wetness, frost action.	Moderate: wetness, droughty.
75C Barco	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Moderate: depth to rock.
75D Barco	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope, depth to rock.
75F Barco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
77B Wakenda	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
77C Wakenda	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
81C Eldon	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Moderate: small stones, large stones.
81D Eldon	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: small stones, large stones, slope.
83D Moko	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, droughty.
83F Moko	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, droughty, slope.
85F Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, large stones, droughty.
99. Pits						

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10A----- Hartwell	Severe: wetness, percs slowly.	Slight-----	Severe: wetness.	Severe: wetness.	Poor: wetness.
10B2----- Hartwell	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
11----- Hartwell	Severe: wetness, percs slowly.	Slight-----	Severe: wetness.	Severe: wetness.	Poor: wetness.
12----- Haig	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
15B----- Bluelick	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----	Poor: too clayey, small stones.
15C----- Bluelick	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, small stones.
15D2----- Bluelick	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.
17B----- Pembroke	Slight-----	Moderate: seepage, slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
17C----- Pembroke	Slight-----	Severe: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
17D----- Pembroke	Moderate: slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
20B, 20B2----- Pershing	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
20C2----- Pershing	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
21B2----- Pershing	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
23B----- Macksburg	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
24B2----------------- Arispe	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: hard to pack.
24C2----------------- Arispe	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: hard to pack.
28B, 28B2----------- Greenton	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
28C2, 28C3, 28D2---- Greenton	Severe: wetness, percs slowly.	Severe: slope.	Severe: seepage, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
31------------------ Otter	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
32------------------ Tanglenook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
33------------------ Dockery	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
34------------------ Arbela	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
38------------------ Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
40------------------ Lamine	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
42------------------ Dameron	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: small stones.
43------------------ Nevin	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
46------------------ Cotter	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
53B, 53B2----------- Friendly	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
54B, 54B2----------- Paintbrush	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: wetness.	Moderate: wetness.	Poor: small stones.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
54C: Paintbrush	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
55B: Bahner	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Moderate: wetness, too clayey.	Slight	Poor: small stones.
55C: Bahner	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, too clayey.	Slight	Poor: small stones.
58B2: Sedalia	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack, small stones.
58C2: Sedalia	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack, small stones.
62B2: Maplewood	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, small stones.
75C, 75D: Barco	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
75F: Barco	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
77B: Wakenda	Moderate: wetness.	Moderate: seepage, slope, wetness.	Moderate: too clayey.	Moderate: wetness.	Fair: too clayey.
77C: Wakenda	Moderate: wetness.	Severe: slope.	Moderate: too clayey.	Moderate: wetness.	Fair: too clayey.
81C: Eldon	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
81D: Eldon	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
83D: Moko	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: depth to rock.
83F: Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
85F----------------- Goss	Severe: slope.	Severe: seepage, slope, large stones.	Severe: slope, too clayey, large stones.	Severe: slope.	Poor: too clayey, small stones, slope.
99. Pits					

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
10A, 10B2, 11 Hartwell	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
12 Haig	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
15B, 15C, 15D2 Bluelick	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
17B, 17C Pembroke	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
17D Pembroke	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
20B, 20B2, 20C2, 21B2 Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
23B Macksburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
24B2, 24C2 Arispe	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
28B, 28B2 Greenton	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
28C2, 28C3, 28D2 Greenton	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
31 Otter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
32 Tanglenook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
33 Dockery	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
34 Arbela	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
38 Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
40: Lamine	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
42: Dameron	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
43: Nevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
46: Cotter	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
53B, 53B2: Friendly	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
54B, 54B2, 54C: Paintbrush	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
55B, 55C: Bahner	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
58B2, 58C2: Sedalia	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
62B2: Maplewood	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
75C: Barco	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.
75D: Barco	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones, slope.
75F: Barco	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
77B, 77C: Wakenda	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
81C, 81D: Eldon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
83D: Moko	Poor: depth to rock, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, large stones.
83F: Moko	Poor: depth to rock, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, large stones, slope.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
85F------------------- Goss	Fair: shrink-swell, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
99. Pits				

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
10A, 10B2, 11----- Hartwell	Slight---------	Severe: wetness.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
12---------------- Haig	Slight---------	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
15B, 15C---------- Bluelick	Moderate: slope.	Slight---------	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
15D2-------------- Bluelick	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
17B, 17C---------- Pembroke	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope----------	Favorable------	Favorable.
17D--------------- Pembroke	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope----------	Slope----------	Slope.
20B, 20B2, 20C2, 21B2------------- Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
23B--------------- Macksburg	Moderate: seepage, slope.	Moderate: wetness.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
24B2, 24C2-------- Arispe	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
28B, 28B2--------- Greenton	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily.
28C2, 28C3-------- Greenton	Moderate: seepage, slope.	Severe: hard to pack.	Percs slowly, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
28D2-------------- Greenton	Severe: slope.	Severe: hard to pack.	Percs slowly, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
31---------------- Otter	Moderate: seepage.	Severe: piping, ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Erodes easily, ponding.	Wetness, erodes easily.
32---------------- Tanglenook	Slight---------	Severe: wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, flooding.	Wetness, percs slowly.	Wetness, percs slowly.
33---------------- Dockery	Moderate: seepage.	Moderate: piping, wetness.	Flooding, frost action.	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
34 Arbela	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
38 Zook	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
40 Lamine	Slight	Severe: wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
42 Dameron	Moderate: seepage.	Slight	Deep to water	Flooding	Favorable	Favorable.
43 Nevin	Moderate: seepage.	Moderate: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Erodes easily.
46 Cotter	Moderate: seepage.	Moderate: piping.	Deep to water	Flooding	Erodes easily	Erodes easily.
53B, 53B2 Friendly	Slight	Moderate: thin layer, piping, large stones.	Percs slowly, large stones.	Wetness, droughty, percs slowly.	Large stones, erodes easily, wetness.	Large stones, wetness, erodes easily.
54B, 54B2, 54C Paintbrush	Moderate: seepage.	Moderate: thin layer, large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Large stones, erodes easily, wetness.	Large stones, erodes easily, droughty.
55B, 55C Bahner	Moderate: seepage, slope.	Moderate: thin layer, large stones.	Deep to water	Slope, percs slowly, erodes easily.	Large stones, erodes easily.	Large stones, erodes easily.
58B2, 58C2 Sedalia	Moderate: slope.	Severe: hard to pack.	Percs slowly, slope.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Erodes easily, percs slowly.
62B2 Maplewood	Moderate: slope.	Severe: hard to pack.	Percs slowly, large stones, slope.	Slope, large stones, wetness.	Large stones, erodes easily.	Large stones, wetness.
75C Barco	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Depth to rock	Depth to rock.
75D, 75F Barco	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
77B, 77C Wakenda	Moderate: seepage, slope.	Slight	Deep to water	Slope	Favorable	Favorable.
81C Eldon	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Droughty, slope.	Large stones	Large stones, droughty.
81D Eldon	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
83D, 83F---------- Moko	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
85F--------------- Goss	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones.	Large stones, slope, droughty.
99. Pits						

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
10A----------- Hartwell	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	80-100	20-35	5-15
	9-12	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	95-100	90-100	30-40	15-20
	12-20	Clay, silty clay.	CH	A-7	0	0	100	100	95-100	90-100	50-65	30-40
	20-60	Silt loam, silty clay loam, silty clay.	CL	A-6, A-7	0	0	100	100	95-100	90-100	35-45	20-25
10B2---------- Hartwell	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	80-100	20-35	5-15
	7-39	Clay, silty clay.	CH	A-7	0	0	100	100	95-100	90-100	50-65	30-40
	39-60	Silt loam, silty clay loam, silty clay.	CL	A-6, A-7	0	0	100	100	95-100	90-100	35-45	20-25
11------------ Hartwell	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	80-100	20-35	5-15
	8-14	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	95-100	90-100	30-40	15-20
	14-53	Clay, silty clay.	CH	A-7	0	0	100	100	95-100	90-100	50-65	30-40
	53-60	Silt loam, silty clay loam, silty clay.	CL	A-6, A-7	0	0	100	100	95-100	90-100	35-45	20-25
12------------ Haig	0-10	Silt loam-----	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	10-20	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	20-45	Silty clay----	CH	A-7	0	0	100	100	100	95-100	50-65	30-40
	45-60	Silty clay loam.	CL, CH	A-7, A-6	0	0	100	100	100	95-100	35-55	20-30
15B----------- Bluelick	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	70-90	25-35	5-15
	7-36	Silty clay loam, silty clay.	CL	A-6, A-7	0	0	85-100	85-100	75-100	60-90	35-50	11-25
	36-60	Extremely gravelly silty clay, very gravelly clay, very gravelly silty clay.	GC	A-2-7, A-7	0	0-10	30-50	25-50	25-45	20-40	50-70	25-45
15C, 15D2----- Bluelick	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	70-90	25-35	5-15
	7-30	Silty clay loam, silty clay.	CL	A-6, A-7	0	0	85-100	85-100	75-100	60-90	35-50	11-25
	30-60	Very cobbly silty clay, very cobbly clay.	GC	A-2-7, A-7	0	30-45	30-50	25-50	25-45	20-40	50-70	25-45

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
17B, 17C, 17D-- Pembroke	0-11	Silt loam-----	ML, CL	A-4, A-6	0	0	95-100	90-100	80-100	70-100	25-40	3-16
	11-60	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	0	90-100	75-100	75-100	65-100	35-65	20-45
20B, 20B2, 20C2, 21B2--- Pershing	0-8	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	8-19	Silty clay loam.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	19-41	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	41-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
23B----------- Macksburg	0-11	Silt loam-----	CL	A-6, A-7	0	0	100	100	100	95-100	30-45	10-20
	11-44	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-60	20-35
	44-60	Silty clay loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	20-30
24B2, 24C2---- Arispe	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-40	5-15
	8-30	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-60	25-35
	30-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	20-30
28B, 28B2----- Greenton	0-6	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	6-24	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	95-100	95-100	50-70	35-45
	24-60	Silty clay, clay.	CH	A-7	---	0	100	100	100	95-100	50-70	25-40
28C2---------- Greenton	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	7-38	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	95-100	95-100	50-70	35-45
	38-48	Silty clay, clay.	CH	A-7	0	0	100	100	100	95-100	50-70	25-40
	48-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
28C3, 28D2---- Greenton	0-8	Silty clay loam.	CL	A-6, A-7	0	0	100	100	95-100	90-100	35-45	15-25
	8-23	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	95-100	95-100	50-70	35-45
	23-49	Silty clay, clay.	CH	A-7	0	0	100	100	100	95-100	50-70	25-40
	49-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
31------------ Otter	0-31	Silt loam-----	CL	A-6, A-7, A-4	0	0	100	95-100	90-100	80-100	25-45	7-20
	31-60	Silt loam, sandy loam, silty clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6, A-7	0	0	90-100	80-100	55-95	45-85	25-45	5-20
32------------ Tanglenook	0-6	Silt loam-----	CL	A-4	0	0	100	100	100	95-100	27-32	7-10
	6-17	Silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	16-25
	17-56	Silty clay----	CL, CH	A-7	0	0	100	100	100	95-100	45-55	25-32
	56-60	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	95-100	95-100	43-55	21-32
33------------ Dockery	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	85-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	0	100	100	90-100	85-95	25-40	8-20
34------------ Arbela	0-16	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	16-30	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	90-100	25-35	5-15
	30-60	Silty clay loam, silty clay.	CL	A-6, A-7	0	0	100	100	95-100	90-100	35-50	20-30
38------------ Zook	0-19	Silty clay loam.	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	19-60	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
40------------ Lamine	0-10	Silt loam-----	CL	A-4	0	0	100	100	90-100	75-90	23-31	7-12
	10-14	Silty clay loam.	CL	A-6, A-7	0	0	100	100	95-100	85-95	32-42	12-20
	14-60	Silty clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	0	100	100	90-100	75-95	35-60	15-35
42------------ Dameron	0-8	Silt loam-----	CL	A-6	0	0-1	95-100	90-100	85-100	80-95	25-40	10-20
	8-23	Silt loam, silty clay loam.	CL	A-6	0	0-1	95-100	90-100	85-100	80-95	25-40	10-20
	23-32	Very gravelly silty clay loam, gravelly silty clay loam.	GC, SC, CL	A-2-6, A-6	0	5-15	35-75	25-70	25-70	20-65	30-40	15-25
	32-60	Gravelly loam, gravelly sandy clay loam, very gravelly sandy clay loam.	GC, SC	A-2-6	0	25-35	35-75	25-70	25-70	20-65	30-40	10-20
43------------ Nevin	0-22	Silt loam-----	CL	A-6, A-7	0	0	100	100	100	90-95	35-45	10-20
	22-38	Silty clay loam.	CL	A-7	0	0	100	100	95-100	90-95	40-50	20-30
	38-60	Silty clay loam, silt loam.	CL	A-7	0	0	100	100	95-100	90-95	40-50	20-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
46------------ Cotter	0-18	Silt loam-----	CL	A-6	0	0	100	100	90-100	80-95	30-40	13-20
	18-37	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	95-100	80-90	30-40	14-22
	37-60	Loam, silt loam.	CL	A-4, A-6	0	0	100	100	90-100	65-80	25-40	8-18
53B----------- Friendly	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-5	85-100	85-100	75-100	65-95	25-35	5-15
	9-21	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	0-5	85-100	85-100	80-100	75-95	35-55	15-30
	21-29	Silt loam-----	CL	A-6	0	0-5	85-100	85-100	75-100	75-95	30-40	10-20
	29-36	Extremely gravelly silt loam, extremely gravelly clay loam.	CL, GC, SC	A-2, A-6, A-7	0	0-55	30-85	25-85	15-75	15-70	30-50	11-25
	36-60	Clay, silty clay, gravelly clay.	CL, CH	A-7	0	0-15	70-95	65-95	60-95	50-90	45-80	25-60
53B2---------- Friendly	0-6	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-5	85-100	85-100	75-100	65-95	25-35	5-15
	6-31	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	0-5	85-100	85-100	80-100	75-95	35-55	15-30
	31-54	Extremely gravelly silty clay loam, extremely gravelly clay loam.	CL, GC, SC	A-2, A-6, A-7	0	0-55	30-85	25-85	15-75	15-70	30-50	11-25
	54-60	Clay, silty clay, gravelly clay.	CL, CH	A-7	0	0-15	70-95	65-95	60-95	50-90	45-80	25-60
54B----------- Paintbrush	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-5	85-100	85-100	70-95	55-95	20-35	5-15
	9-21	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	0-5	75-95	75-95	70-95	50-90	30-50	11-25
	21-43	Gravelly silt loam, gravelly clay loam, extremely cobbly clay loam.	CL, GC, SC	A-2, A-6, A-7	0	0-55	30-85	25-85	20-75	15-70	35-50	15-25
	43-65	Silty clay, clay, gravelly silty clay.	CL, CH	A-7	0	0-15	70-95	65-90	60-90	50-90	45-85	25-60

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
54B2, 54C----- Paintbrush	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-5	85-100	85-100	70-95	55-95	20-35	5-15
	9-21	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	0-5	75-95	75-95	70-95	50-90	30-50	11-25
	21-43	Extremely cobbly clay loam, gravelly clay loam, extremely cobbly silty clay loam.	CL, GC, SC	A-2, A-6, A-7	0	0-55	30-85	25-85	20-75	15-70	35-50	15-25
	43-60	Silty clay, clay, gravelly silty clay.	CL, CH	A-7	0	0-15	70-95	65-90	60-90	50-90	45-85	25-60
55B----------- Bahner	0-9	Silt loam-----	CL	A-4, A-6	0	0-5	85-100	85-100	75-100	65-95	25-35	8-15
	9-27	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	0-5	85-100	85-100	80-100	75-95	35-55	15-30
	27-50	Extremely gravelly clay loam, very gravelly silty clay loam.	CL, GC, SC	A-2, A-6, A-7	0	10-55	30-90	25-90	25-90	20-85	35-50	15-25
	50-60	Gravelly clay, cobbly clay.	CL, CH	A-7	0	5-30	70-95	65-95	60-95	50-90	45-85	25-60
55C----------- Bahner	0-6	Silt loam-----	CL	A-4, A-6	0	0-5	85-100	85-100	75-100	65-95	25-35	8-15
	6-32	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	0-5	85-100	85-100	80-100	75-95	35-55	15-30
	32-60	Extremely gravelly clay loam, very gravelly silty clay loam.	CL, GC, SC	A-2, A-6, A-7	0	10-55	30-90	25-90	25-90	20-85	35-50	15-25
58B2---------- Sedalia	0-7	Silty clay loam.	CL, CL-ML	A-4, A-6	0	0-5	85-100	85-100	75-100	65-95	25-40	5-15
	7-34	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	0-5	85-100	85-100	80-100	75-95	35-55	15-30
	34-50	Gravelly silty clay loam, extremely cobbly clay loam.	CL, GC, SC	A-2, A-6, A-7	0	5-55	30-85	25-85	25-85	20-80	35-50	15-25
	50-60	Clay, gravelly clay, cobbly clay.	CL, CH	A-7	0	0-15	85-100	60-95	55-85	50-80	45-85	29-60

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
58C2---------- Sedalia	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	0-5	85-100	85-100	75-100	65-95	25-40	5-15
	7-24	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	0-5	85-100	85-100	80-100	75-95	35-55	15-30
	24-37	Gravelly silty clay loam, extremely gravelly clay loam.	CL, GC, SC	A-2, A-6, A-7	0	5-55	30-85	25-85	25-85	20-80	35-50	15-25
	37-60	Clay, gravelly clay, cobbly clay.	CL, CH	A-7	0	0-15	85-100	60-95	55-85	50-80	45-85	29-60
62B2---------- Maplewood	0-6	Silt loam-----	CL	A-4, A-6	0	0-5	85-100	85-100	75-100	75-95	25-40	5-15
	6-17	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	0-5	85-100	85-100	80-100	75-95	35-60	15-35
	17-32	Silt loam, silty clay loam, gravelly silty clay loam.	CL, GC, SC	A-2, A-6, A-7	0	0-55	30-90	25-90	25-90	20-85	35-50	14-25
	32-60	Very cobbly silty clay, very cobbly clay, clay.	CL, CH, GC, SC	A-2, A-7	0-10	0-40	40-90	35-90	30-90	25-80	45-85	25-60
75C, 75D------ Barco	0-8	Loam----------	ML, CL-ML, CL	A-4, A-6	0	0	100	100	85-95	50-75	22-35	2-14
	8-26	Loam, sandy clay loam, clay loam.	CL, SC	A-6	0	0-5	85-100	85-100	75-100	45-80	25-40	11-22
	26-45	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
75F----------- Barco	0-9	Loam----------	CL-ML, CL, ML	A-4, A-6	0-5	0-10	100	100	85-95	50-75	22-35	2-14
	9-26	Loam, sandy clay loam, clay loam.	CL, SC	A-6	0-5	0-10	85-100	85-100	75-100	45-80	25-40	11-22
	26-45	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
77B, 77C------ Wakenda	0-11	Silt loam-----	CL, ML	A-6, A-4	0	0	100	100	100	90-100	30-40	5-15
	11-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	90-100	35-45	15-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
81C----------- Eldon	0-7	Gravelly silt loam.	ML, CL-ML, CL	A-4	0-5	0-25	70-95	65-90	60-85	55-80	20-30	2-8
	7-22	Very gravelly silty clay loam, gravelly silty clay loam.	GC, CH, CL	A-2-7, A-7	0-5	5-15	40-60	30-55	20-55	20-55	40-60	20-30
	22-28	Very gravelly silty clay, very gravelly clay.	GC	A-2-7, A-7	0-5	0-10	35-55	30-50	25-50	25-50	40-60	25-45
	28-60	Silty clay, clay, gravelly clay.	CL, CH, ML, MH	A-7	0	0-15	80-100	65-100	65-100	65-100	45-95	25-50
81D----------- Eldon	0-8	Gravelly silt loam.	ML, CL-ML, CL	A-4	0-5	0-25	70-95	65-90	60-85	55-80	20-30	2-8
	8-48	Very gravelly silty clay, very gravelly clay.	GC	A-2-7, A-7	0-5	0-10	35-55	30-50	25-50	25-50	40-60	25-45
	48-60	Silty clay, clay, gravelly clay.	CL, CH, ML, MH	A-7	0	0-15	80-100	65-100	65-100	65-100	45-95	25-50
83D----------- Moko	0-4	Very channery silt loam.	CL, GC, SC	A-6	0-10	40-65	65-90	60-85	55-80	40-75	25-35	10-15
	4-10	Extremely channery silt loam, very channery silty clay loam, very channery silt loam.	CL, GC, SC	A-6, A-7	0-10	40-80	65-90	60-85	55-80	40-80	25-45	10-20
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
83F----------- Moko	0-4	Very channery loam.	CL, GC, SC	A-6	0-10	40-65	65-90	60-85	55-80	40-75	25-35	10-15
	4-7	Extremely channery silt loam, very channery clay loam, very channery silty clay loam.	CL, GC, SC	A-6, A-7	0-10	40-80	65-90	60-85	55-80	40-80	25-45	10-20
	7	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
85F----------- Goss	0-3	Very cobbly silt loam.	GM, GC, GM-GC	A-2	---	10-50	40-60	35-65	30-50	25-35	20-30	2-10
	3-22	Very cobbly silty clay loam, very cobbly silt loam.	GM, GC, GM-GC	A-2	0	10-50	40-60	35-65	30-50	25-35	20-30	2-10
	22-60	Cobbly silty clay loam, very cobbly silty clay, very cobbly clay.	GC, SC	A-7, A-2-7	---	10-50	45-70	20-65	20-50	20-45	50-70	30-40
99. Pits												

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
10A	0-9	15-27	1.30-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.43	3	6	2-4
Hartwell	9-12	15-32	1.30-1.40	0.2-0.6	0.18-0.20	5.1-7.3	Moderate	0.43			
	12-20	40-55	1.30-1.40	0.06-0.2	0.09-0.13	5.1-7.3	High	0.32			
	20-60	25-45	1.30-1.40	0.06-0.2	0.18-0.20	5.1-7.3	Moderate	0.43			
10B2	0-7	15-27	1.30-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.43	3	6	2-3
Hartwell	7-39	40-55	1.30-1.40	0.06-0.2	0.09-0.13	5.1-7.3	High	0.32			
	39-60	25-45	1.30-1.40	0.06-0.2	0.18-0.20	5.1-7.3	Moderate	0.43			
11	0-8	15-27	1.30-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.43	3	6	2-4
Hartwell	8-14	15-32	1.30-1.40	0.2-0.6	0.18-0.20	5.1-7.3	Moderate	0.43			
	14-53	40-55	1.30-1.40	0.06-0.2	0.09-0.13	5.1-7.3	High	0.32			
	53-60	25-45	1.30-1.40	0.06-0.2	0.18-0.20	5.1-7.3	Moderate	0.43			
12	0-10	22-27	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate	0.37	3	6	3-4
Haig	10-20	28-48	1.30-1.35	0.6-2.0	0.21-0.23	5.1-6.0	High	0.37			
	20-45	40-50	1.30-1.45	<0.2	0.12-0.14	5.1-6.0	High	0.32			
	45-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	6.1-7.3	High	0.43			
15B	0-7	18-27	1.25-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.37	4	6	1-2
Bluelick	7-36	35-45	1.20-1.40	0.2-0.6	0.10-0.18	4.5-7.3	Moderate	0.37			
	36-60	45-70	1.20-1.40	0.2-0.6	0.02-0.08	4.5-6.5	Moderate	0.20			
15C, 15D2	0-7	18-27	1.25-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.37	4	6	1-2
Bluelick	7-30	35-45	1.20-1.40	0.2-0.6	0.10-0.18	4.5-7.3	Moderate	0.37			
	30-60	45-70	1.20-1.40	0.2-0.6	0.02-0.08	4.5-6.5	Moderate	0.20			
17B, 17C, 17D	0-11	15-27	1.30-1.50	0.6-2.0	0.18-0.23	4.5-7.3	Low	0.32	5	6	2-4
Pembroke	11-60	36-60	1.35-1.65	0.6-2.0	0.13-0.19	4.5-6.0	Moderate	0.28			
20B, 20B2, 20C2, 21B2	0-8	20-27	1.30-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37	3	6	2-3
Pershing	8-19	27-35	1.30-1.40	0.2-0.6	0.20-0.22	5.1-6.5	Moderate	0.43			
	19-41	35-48	1.35-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High	0.43			
	41-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High	0.43			
23B	0-11	24-27	1.30-1.45	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.32	5	6	4-6
Macksburg	11-44	36-42	1.35-1.40	0.2-0.6	0.18-0.20	5.1-7.3	High	0.43			
	44-60	30-38	1.40-1.45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43			
24B2, 24C2	0-8	25-27	1.35-1.40	0.6-2.0	0.21-0.23	5.6-7.3	Low	0.37	3	6	2-3
Arispe	8-30	38-42	1.35-1.45	0.06-0.2	0.18-0.20	5.6-7.3	High	0.43			
	30-60	24-35	1.40-1.50	0.6-2.0	0.18-0.20	5.6-7.3	High	0.43			
28B, 28B2	0-6	20-27	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	3	6	2-3
Greenton	6-24	35-50	1.35-1.50	0.06-0.2	0.11-0.15	5.6-7.3	High	0.37			
	24-60	40-50	1.35-1.50	0.06-0.2	0.08-0.12	6.6-7.8	High	0.37			
28C2	0-7	20-27	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	3	6	2-3
Greenton	7-38	35-50	1.35-1.50	0.06-0.2	0.11-0.15	5.6-8.4	High	0.37			
	38-48	40-50	1.35-1.50	0.06-0.2	0.08-0.12	6.1-8.4	High	0.37			
	48-60	---	---	0.01-0.2	---	---	---	----			
28C3, 28D2	0-8	27-35	1.30-1.45	0.2-0.6	0.12-0.18	5.6-7.3	Moderate	0.37	3	7	2-3
Greenton	8-23	35-50	1.35-1.50	0.06-0.2	0.11-0.15	5.6-8.4	High	0.37			
	23-49	40-50	1.35-1.50	0.06-0.2	0.08-0.12	6.1-8.4	High	0.37			
	49-60	---	---	0.01-0.2	---	---	---	----			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
31 Otter	0-31	18-27	1.10-1.25	0.6-2.0	0.22-0.24	6.1-7.8	Low	0.28	5	6	3-10
	31-60	15-28	1.30-1.55	0.6-2.0	0.15-0.20	6.1-8.4	Low	0.43			
32 Tanglenook	0-6	20-27	1.25-1.30	0.6-2.0	0.21-0.25	6.1-7.3	Low	0.32	5	6	2-4
	6-17	27-40	1.30-1.40	0.2-0.6	0.18-0.21	6.1-7.3	Moderate	0.32			
	17-56	40-50	1.40-1.45	0.06-0.2	0.10-0.13	5.6-7.3	High	0.32			
	56-60	35-50	1.40-1.50	0.06-0.2	0.10-0.18	5.6-7.3	High	0.32			
33 Dockery	0-7	15-27	1.35-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	6	2-4
	7-60	18-30	1.35-1.45	0.6-2.0	0.20-0.24	5.6-7.8	Moderate	0.37			
34 Arbela	0-16	20-27	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.32	5	6	2-4
	16-30	18-27	1.35-1.55	0.6-2.0	0.20-0.22	5.1-6.5	Low	0.43			
	30-60	35-45	1.30-1.40	0.2-0.6	0.18-0.20	4.5-6.0	Moderate	0.43			
38 Zook	0-19	35-40	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	High	0.37	5	7	5-7
	19-60	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	High	0.28			
40 Lamine	0-10	18-27	1.25-1.30	0.2-0.6	0.21-0.25	4.5-7.3	Low	0.43	5	6	.5-1
	10-14	27-40	1.30-1.40	0.06-0.2	0.19-0.22	5.1-6.5	Moderate	0.43			
	14-60	35-55	1.40-1.50	<0.06	0.10-0.20	4.5-7.3	High	0.32			
42 Dameron	0-8	20-27	1.25-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low	0.32	4	6	2-4
	8-23	20-32	1.25-1.40	0.6-2.0	0.18-0.24	6.1-7.3	Moderate	0.32			
	23-32	27-32	1.20-1.55	0.6-2.0	0.04-0.10	5.6-7.3	Low	0.28			
	32-60	18-27	1.20-1.50	0.6-2.0	0.04-0.10	5.6-7.3	Low	0.20			
43 Nevin	0-22	25-27	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.32	5	6	2-4
	22-38	30-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.43			
	38-60	25-36	1.40-1.45	0.6-2.0	0.18-0.20	6.6-7.3	Moderate	0.43			
46 Cotter	0-18	18-27	1.35-1.45	0.6-2.0	0.21-0.25	5.6-7.8	Moderate	0.32	5	6	3-4
	18-37	25-35	1.25-1.40	0.6-2.0	0.18-0.21	5.1-7.3	Moderate	0.43			
	37-60	18-27	1.30-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.43			
53B Friendly	0-9	15-30	1.30-1.50	0.6-2.0	0.17-0.22	5.6-7.3	Low	0.37	3	6	1-3
	9-21	35-55	1.30-1.60	0.06-0.2	0.11-0.17	5.6-7.8	High	0.37			
	21-29	18-27	1.50-1.70	0.06-0.2	0.10-0.15	5.6-7.8	Low	0.37			
	29-36	24-40	1.50-1.70	0.06-0.2	0.01-0.08	5.6-7.8	Low	0.28			
	36-60	40-85	1.20-1.50	0.2-0.6	0.08-0.10	5.6-7.8	High	0.24			
53B2 Friendly	0-6	15-30	1.30-1.50	0.6-2.0	0.17-0.22	5.6-7.3	Low	0.37	3	6	1-3
	6-31	35-55	1.30-1.60	0.06-0.2	0.11-0.17	5.6-7.8	High	0.37			
	31-54	24-40	1.50-1.70	0.06-0.2	0.01-0.08	5.6-7.8	Low	0.28			
	54-60	40-85	1.20-1.50	0.2-0.6	0.08-0.10	5.6-7.8	High	0.24			
54B Paintbrush	0-9	12-27	1.35-1.55	0.6-2.0	0.16-0.20	5.1-7.3	Low	0.37	4	6	1-3
	9-21	20-35	1.30-1.55	0.6-2.0	0.12-0.17	4.5-6.5	Moderate	0.37			
	21-43	25-35	1.50-1.70	0.06-0.2	0.01-0.08	4.5-6.5	Low	0.28			
	43-65	40-85	1.20-1.50	0.2-0.6	0.08-0.10	5.6-7.3	High	0.24			
54B2, 54C Paintbrush	0-9	12-27	1.35-1.55	0.6-2.0	0.16-0.20	5.1-7.3	Low	0.37	4	6	1-3
	9-21	20-35	1.30-1.55	0.6-2.0	0.12-0.17	4.5-6.5	Moderate	0.37			
	21-43	25-35	1.50-1.70	0.06-0.2	0.01-0.08	4.5-6.5	Low	0.28			
	43-60	40-85	1.20-1.50	0.2-0.6	0.08-0.10	5.6-7.3	High	0.24			
55B Bahner	0-9	15-27	1.38-1.50	0.6-2.0	0.17-0.22	5.1-7.3	Low	0.37	4	6	1-3
	9-27	27-45	1.30-1.60	0.6-2.0	0.13-0.17	4.5-6.5	Moderate	0.37			
	27-50	27-40	1.50-1.70	0.06-0.2	0.01-0.08	5.1-6.5	Low	0.28			
	50-60	40-85	1.20-1.70	0.2-0.6	0.08-0.10	5.6-7.3	High	0.24			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
55C--------------- Bahner	0-6	15-27	1.38-1.50	0.6-2.0	0.17-0.22	5.1-7.3	Low-----------	0.37	4	6	1-3
	6-32	27-45	1.30-1.60	0.6-2.0	0.13-0.17	4.5-6.5	Moderate-----	0.37			
	32-60	27-40	1.50-1.70	0.06-0.2	0.01-0.08	5.1-6.5	Low-----------	0.28			
58B2-------------- Sedalia	0-7	15-30	1.30-1.50	0.2-0.6	0.17-0.22	5.6-7.3	Low-----------	0.37	4	6	1-3
	7-34	35-50	1.30-1.60	0.06-0.2	0.11-0.13	5.1-6.5	High----------	0.37			
	34-50	35-40	1.30-1.60	0.2-0.6	0.02-0.08	5.6-7.3	Moderate-----	0.28			
	50-60	45-85	1.20-1.50	0.2-0.6	0.08-0.10	5.6-7.3	High----------	0.24			
58C2-------------- Sedalia	0-7	15-30	1.30-1.50	0.2-0.6	0.17-0.22	5.6-7.3	Low-----------	0.37	4	6	1-3
	7-24	35-50	1.30-1.60	0.06-0.2	0.11-0.13	5.1-6.5	High----------	0.37			
	24-37	35-40	1.30-1.60	0.2-0.6	0.02-0.08	5.6-7.3	Moderate-----	0.28			
	37-60	45-85	1.20-1.50	0.2-0.6	0.08-0.10	5.6-7.3	High----------	0.24			
62B2-------------- Maplewood	0-6	15-27	1.30-1.50	0.2-0.6	0.17-0.22	5.6-7.3	Low-----------	0.37	3	6	1-3
	6-17	35-55	1.30-1.60	0.2-0.6	0.11-0.13	5.1-7.3	High----------	0.37			
	17-32	25-40	1.50-1.70	0.06-0.2	0.05-0.12	5.6-7.8	Low-----------	0.28			
	32-60	40-85	1.20-1.50	0.2-0.6	0.08-0.10	5.6-7.8	High----------	0.24			
75C, 75D---------- Barco	0-8	10-25	1.20-1.45	2.0-6.0	0.16-0.21	5.1-7.3	Low-----------	0.32	4	5	1-3
	8-26	18-35	1.40-1.60	0.6-2.0	0.12-0.16	4.5-6.5	Moderate-----	0.28			
	26-45	---	---	0.2-0.6	---	---	--------------	----			
	45	---	---	0.2-2.0	---	---	--------------	----			
75F--------------- Barco	0-9	10-25	1.20-1.45	2.0-6.0	0.16-0.21	5.1-6.0	Low-----------	0.32	4	5	1-3
	9-26	18-35	1.40-1.60	0.6-2.0	0.12-0.16	4.5-6.5	Moderate-----	0.28			
	26-45	---	---	0.2-0.6	---	---	--------------	----			
	45	---	---	0.01-0.2	---	---	--------------	----			
77B, 77C---------- Wakenda	0-11	20-27	1.20-1.30	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.28	5	6	3-4
	11-60	25-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.28			
81C--------------- Eldon	0-7	15-27	1.40-1.55	2.0-6.0	0.13-0.18	4.5-7.3	Low-----------	0.24	2	8	1-3
	7-22	35-60	1.35-1.45	0.6-2.0	0.05-0.14	4.5-7.3	Moderate-----	0.24			
	22-28	40-60	1.35-1.45	0.6-2.0	0.04-0.08	4.5-7.3	Moderate-----	0.24			
	28-60	35-95	1.35-1.45	0.6-2.0	0.10-0.14	4.5-7.8	Moderate-----	0.24			
81D--------------- Eldon	0-8	15-27	1.40-1.55	2.0-6.0	0.13-0.18	4.5-7.3	Low-----------	0.24	2	8	1-3
	8-48	40-60	1.35-1.45	0.6-2.0	0.04-0.08	4.5-7.3	Moderate-----	0.24			
	48-60	35-95	1.35-1.45	0.6-2.0	0.10-0.14	4.5-7.8	Moderate-----	0.24			
83D--------------- Moko	0-4	18-27	1.25-1.60	0.6-2.0	0.08-0.13	6.6-7.8	Low-----------	0.24	1	8	2-4
	4-10	18-35	1.25-1.60	0.6-2.0	0.03-0.14	6.6-7.8	Low-----------	0.28			
	10	---	---	0.00-0.2	---	---	--------------	----			
83F--------------- Moko	0-4	18-27	1.25-1.60	0.6-2.0	0.08-0.13	6.6-7.8	Low-----------	0.24	1	8	2-4
	4-7	18-35	1.25-1.60	0.6-2.0	0.03-0.14	6.6-7.8	Low-----------	0.28			
	7	---	---	0.00-0.2	---	---	--------------	----			
85F--------------- Goss	0-3	20-27	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.5	Low-----------	0.10	2	8	.5-2
	3-22	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.0	Low-----------	0.10			
	22-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-7.3	Moderate-----	0.10			
99. Pits											

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "frequent," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
10A, 10B2, 11----- Hartwell	D	None--------	---	---	0.5-1.5	Perched	Nov-Apr	>60	---	Moderate	High-----	Moderate.
12---------------- Haig	C/D	None--------	---	---	1.0-2.0	Apparent	Nov-Apr	>60	---	High-----	High-----	Moderate.
15B, 15C, 15D2---- Bluelick	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	High.
17B, 17C, 17D----- Pembroke	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
20B, 20B2, 20C2, 21B2------------ Pershing	C	None--------	---	---	2.0-4.0	Perched	Nov-Apr	>60	---	High-----	High-----	Moderate.
23B--------------- Macksburg	B	None--------	---	---	2.0-4.0	Apparent	Apr-Apr	>60	---	High-----	High-----	Moderate.
24B2, 24C2-------- Arispe	C	None--------	---	---	2.0-4.0	Perched	Nov-Apr	>60	---	High-----	High-----	Moderate.
28B, 28B2--------- Greenton	C	None--------	---	---	1.5-3.0	Perched	Nov-Apr	>60	---	Moderate	High-----	Moderate.
28C2, 28C3, 28D2-- Greenton	C	None--------	---	---	1.5-3.0	Perched	Nov-Apr	40-60	Soft	Moderate	High-----	Moderate.
31---------------- Otter	B/D	Frequent----	Brief-----	Nov-May	+.5-2.0	Apparent	Mar-Apr	>60	---	High-----	High-----	Low.
32---------------- Tanglenook	D	Occasional	Brief-----	Nov-May	0-1.5	Apparent	Nov-Apr	>60	---	High-----	High-----	Moderate.
33---------------- Dockery	C	Frequent----	Brief-----	Nov-May	2.0-3.0	Apparent	Nov-Apr	>60	---	High-----	Moderate	Low.
34---------------- Arbela	C	Occasional	Brief-----	Nov-Apr	0-1.5	Apparent	Nov-Apr	>60	---	High-----	High-----	Moderate.
38---------------- Zook	C/D	Frequent----	Brief-----	Nov-May	0-3.0	Apparent	Nov-Apr	>60	---	High-----	High-----	Moderate.
40---------------- Lamine	D	Occasional	Brief-----	Nov-May	1.0-2.5	Apparent	Nov-Apr	>60	---	High-----	High-----	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
42----------------- Dameron	B	Frequent----	Very brief	Nov-May	>6.0	---	---	>60	---	Moderate	Low------	Low.
43----------------- Nevin	B	Occasional	Very brief	Nov-May	2.0-4.0	Apparent	Nov-Apr	>60	---	High-----	High-----	Low.
46----------------- Cotter	B	Occasional	Very brief	Nov-May	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
53B, 53B2--------- Friendly	D	None--------	---	---	1.0-2.0	Perched	Nov-Apr	>60	---	Moderate	High-----	Moderate.
54B, 54B2, 54C---- Paintbrush	C	None--------	---	---	1.5-3.0	Perched	Nov-Apr	>60	---	Moderate	High-----	Moderate.
55B, 55C---------- Bahner	C	None--------	---	---	3.5-6.0	Perched	Nov-Apr	>60	---	Moderate	High-----	Moderate.
58B2, 58C2-------- Sedalia	C	None--------	---	---	1.5-3.0	Perched	Nov-Apr	>60	---	Moderate	High-----	Moderate.
62B2-------------- Maplewood	C	None--------	---	---	1.0-2.0	Perched	Nov-Apr	>60	---	Moderate	High-----	Moderate.
75C, 75D, 75F----- Barco	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	Moderate.
77B, 77C---------- Wakenda	B	None--------	---	---	4.0-6.0	Perched	Nov-Apr	>60	---	High-----	Low------	Moderate.
81C, 81D---------- Eldon	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
83D, 83F---------- Moko	D	None--------	---	---	>6.0	---	---	6-20	Hard	Low------	Low------	Low.
85F--------------- Goss	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
99. Pits												

TABLE 18.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

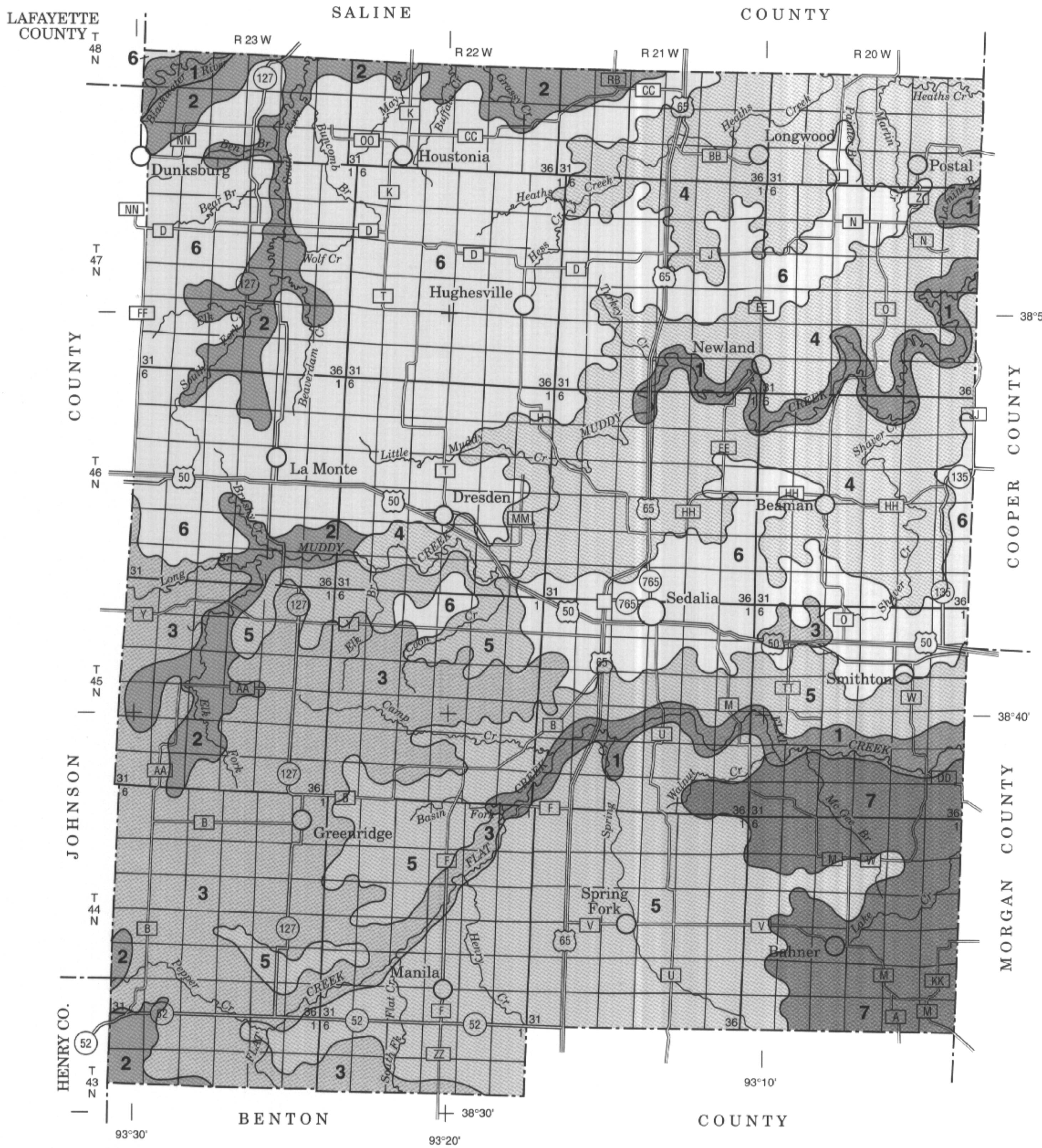
Soil name	Family or higher taxonomic class
Arbela	Fine, montmorillonitic, mesic Argiaquic Argialbolls
*Arispe	Fine, montmorillonitic, mesic Aquic Argiudolls
Bahner	Fine, mixed, mesic Mollic Paleudalfs
Barco	Fine-loamy, mixed, thermic Mollic Hapludalfs
Bluelick	Fine, mixed, mesic Typic Paleudalfs
Cotter	Fine-silty, mixed, mesic Typic Argiudolls
Dameron	Fine-loamy, mixed, mesic Cumulic Hapludolls
Dockery	Fine-silty, mixed, nonacid, mesic Aquic Udifluvents
Eldon	Clayey-skeletal, mixed, mesic Mollic Paleudalfs
Friendly	Fine, mixed, mesic Albaquic Hapludalfs
Goss	Clayey-skeletal, mixed, mesic Typic Paleudalfs
*Greenton	Fine, montmorillonitic, mesic Aquic Argiudolls
Haig	Fine, montmorillonitic, mesic Typic Argiaquolls
Hartwell	Fine, mixed, thermic Typic Argialbolls
Lamine	Fine, mixed, mesic Aeric Ochraqualfs
Macksburg	Fine, montmorillonitic, mesic Aquic Argiudolls
Maplewood	Fine, mixed, mesic Aquollic Hapludalfs
Moko	Loamy-skeletal, mixed, mesic Lithic Hapludolls
Nevin	Fine-silty, mixed, mesic Aquic Argiudolls
Otter	Fine-silty, mixed, mesic Cumulic Haplaquolls
Paintbrush	Fine-loamy, mixed, mesic Aquic Paleudalfs
Pembroke	Fine-silty, mixed, mesic Mollic Paleudalfs
Pershing	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Sedalia	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Tanglenook	Fine, mixed, mesic Typic Argiaquolls
Wakenda	Fine-silty, mixed, mesic Typic Argiudolls
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls

☆ U.S. GOVERNMENT PRINTING OFFICE : 1995—387-974/00535/SCS

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



N

Index Map

Welcome Page

Manuscript

SOIL LEGEND*

1	Dockery-Tanglenook-Lamine association
2	Pershing-Greenton-Dockery association
3	Hartwell association
4	Bluelick-Goss-Pembroke association
5	Maplewood-Paintbrush-Eldon association
6	Arispe-Macksburg-Greenton association
7	Eldon-Paintbrush-Bahner association

* The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1994

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
MISSOURI AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

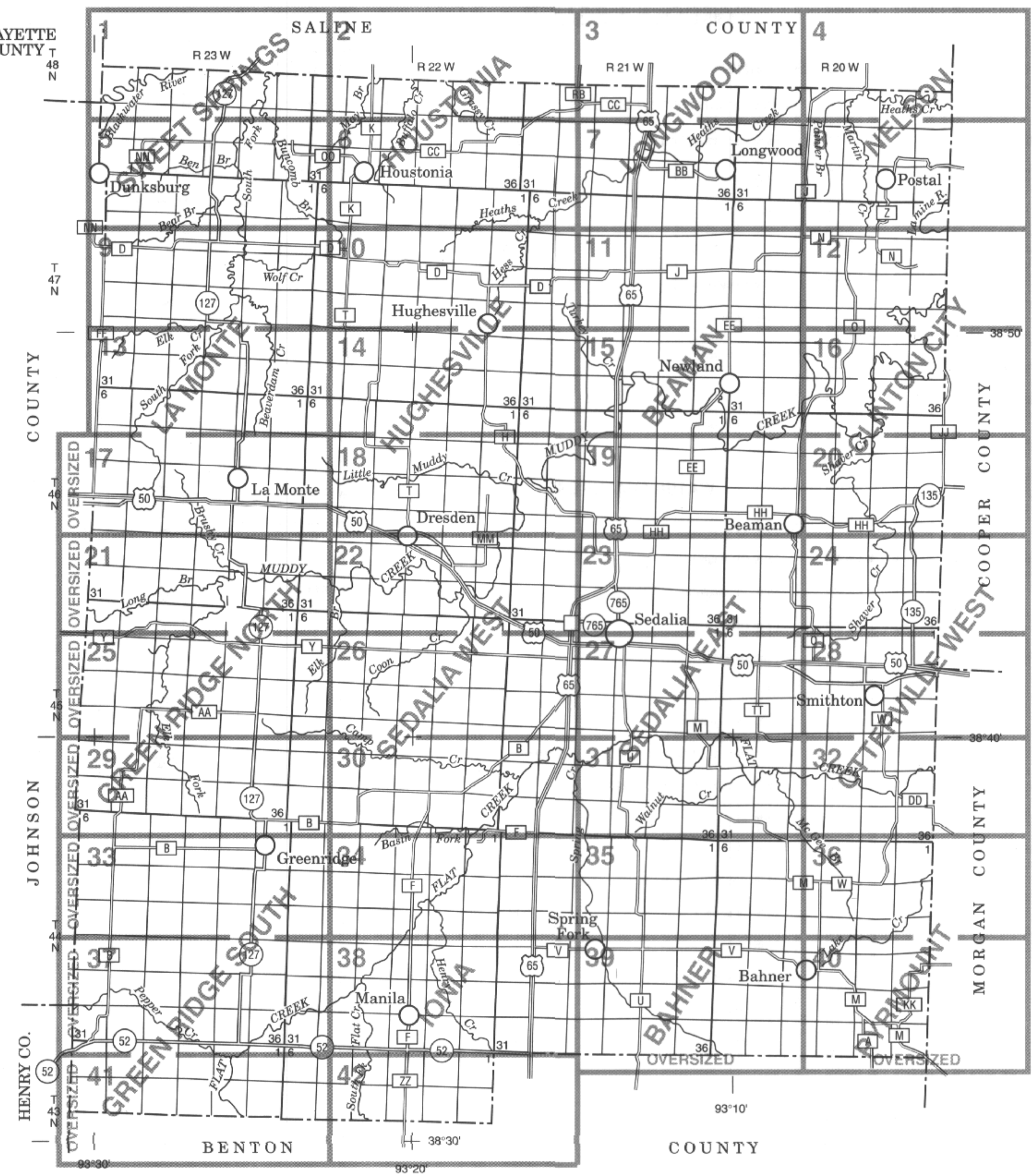
PETTIS COUNTY, MISSOURI

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



N

General Soil Map

Welcome Page

Manuscript

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Legend

INDEX TO MAP SHEETS

PETTIS COUNTY, MISSOURI

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded and 3 that it is severely eroded.

SYMBOL	NAME
10A	Hartwell silt loam, 0 to 2 percent slopes
10B2	Hartwell silt loam, 1 to 3 percent slopes, eroded
11	Hartwell silt loam, foot slopes, 0 to 1 percent slopes
12	Haig silt loam
15B	Bluelick silt loam, 2 to 5 percent slopes
15C	Bluelick silt loam, 5 to 9 percent slopes
15D2	Bluelick silt loam, 9 to 16 percent slopes, eroded
17B	Pembroke silt loam, 2 to 5 percent slopes
17C	Pembroke silt loam, 5 to 9 percent slopes
17D	Pembroke silt loam, 9 to 16 percent slopes
20B	Pershing silt loam, 2 to 5 percent slopes
20B2	Pershing silt loam, 2 to 5 percent slopes, eroded
20C2	Pershing silt loam, 5 to 9 percent slopes, eroded
21B2	Pershing silt loam, foot slopes, 2 to 5 percent slopes, eroded
23B	Macksburg silt loam, 1 to 5 percent slopes
24B2	Arispe silt loam, 2 to 5 percent slopes, eroded
24C2	Arispe silt loam, 5 to 9 percent slopes, eroded
28B	Greenton silt loam, foot slopes, 2 to 5 percent slopes
28B2	Greenton silt loam, 2 to 5 percent slopes, eroded
28C2	Greenton silt loam, bedrock substratum, 5 to 9 percent slopes, eroded
28C3	Greenton silty clay loam, bedrock substratum, 5 to 9 percent slopes, eroded
28D2	Greenton silty clay loam, Bedrock substratum, 9 to 14 percent slopes, eroded
31	Otter silt loam
32	Tanglenook silt loam
33	Dockery silt loam
34	Arbela silt loam
38	Zook silty clay loam
40	Lamine silt loam
42	Dameron silt loam
43	Nevin silt loam
46	Cotter silt loam
53B	Friendly silt loam, 1 to 3 percent slopes
53B2	Friendly silt loam, 1 to 4 percent slopes, eroded
54B	Paintbrush silt loam, 2 to 5 percent slopes
54B2	Paintbrush silt loam, 2 to 5 percent slopes, eroded
54C	Paintbrush silt loam, 5 to 9 percent slopes
55B	Bahner silt loam, 2 to 5 percent slopes
55C	Bahner silt loam, 5 to 9 percent slopes
58B2	Sedalia silty clay loam, 2 to 5 percent slopes, eroded
58C2	Sedalia silt loam, 5 to 9 percent slopes, eroded
62B2	Maplewood silt loam, 2 to 5 percent slopes, eroded
75C	Barco loam, 5 to 9 percent slopes
75D	Barco loam, 9 to 14 percent slopes
75F	Barco loam, 14 to 35 percent slopes, very stony
77B	Wakenda silt loam, 2 to 5 percent slopes
77C	Wakenda silt loam, 5 to 9 percent slopes
81C	Eldon gravelly silt loam, 3 to 9 percent slopes
81D	Eldon gravelly silt loam, 9 to 14 percent slopes
83D	Moko very channery silt loam, 5 to 14 percent slopes
83F	Moko very channery loam, 14 to 50 percent slopes
85F	Goss very cobbly silt loam, 14 to 35 percent slopes
99	Pits, quarries

Index Map

Welcome Page

Manuscript

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER
(sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE
(normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small (Named where applicable)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE (normally not shown)

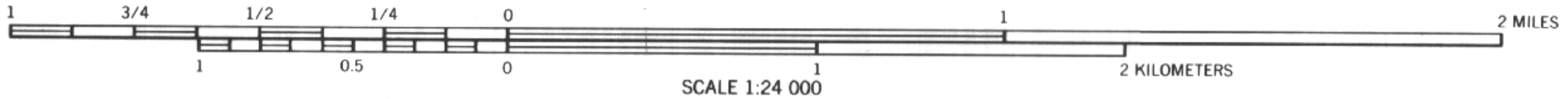
MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

Index Map Welcome Page Manuscript

1

N

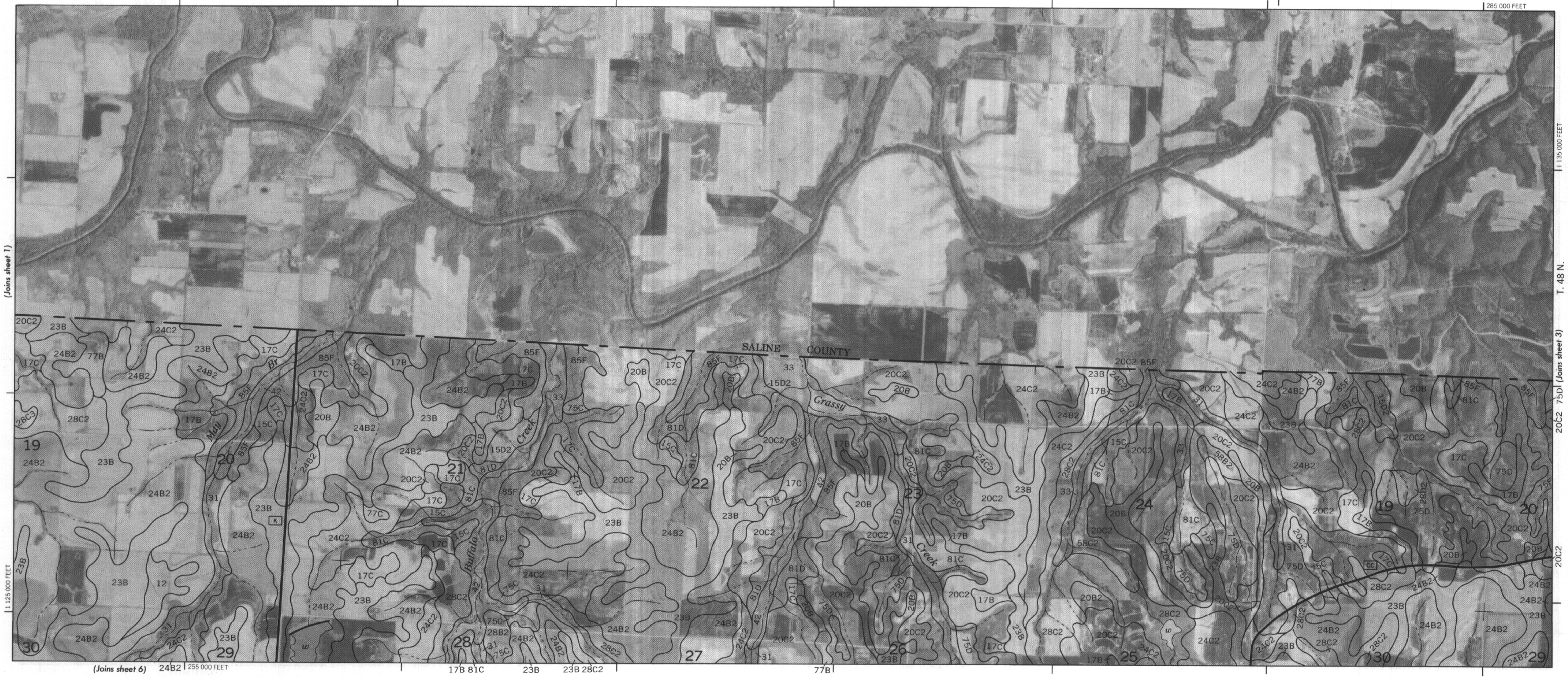


SCALE 1:24 000

2

N

Index Map Welcome Page Manuscript



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

3

N

PETTIS COUNTY, MISSOURI NO. 3

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

N

1 3/4 1/2 1/4 0 1 2 MILES

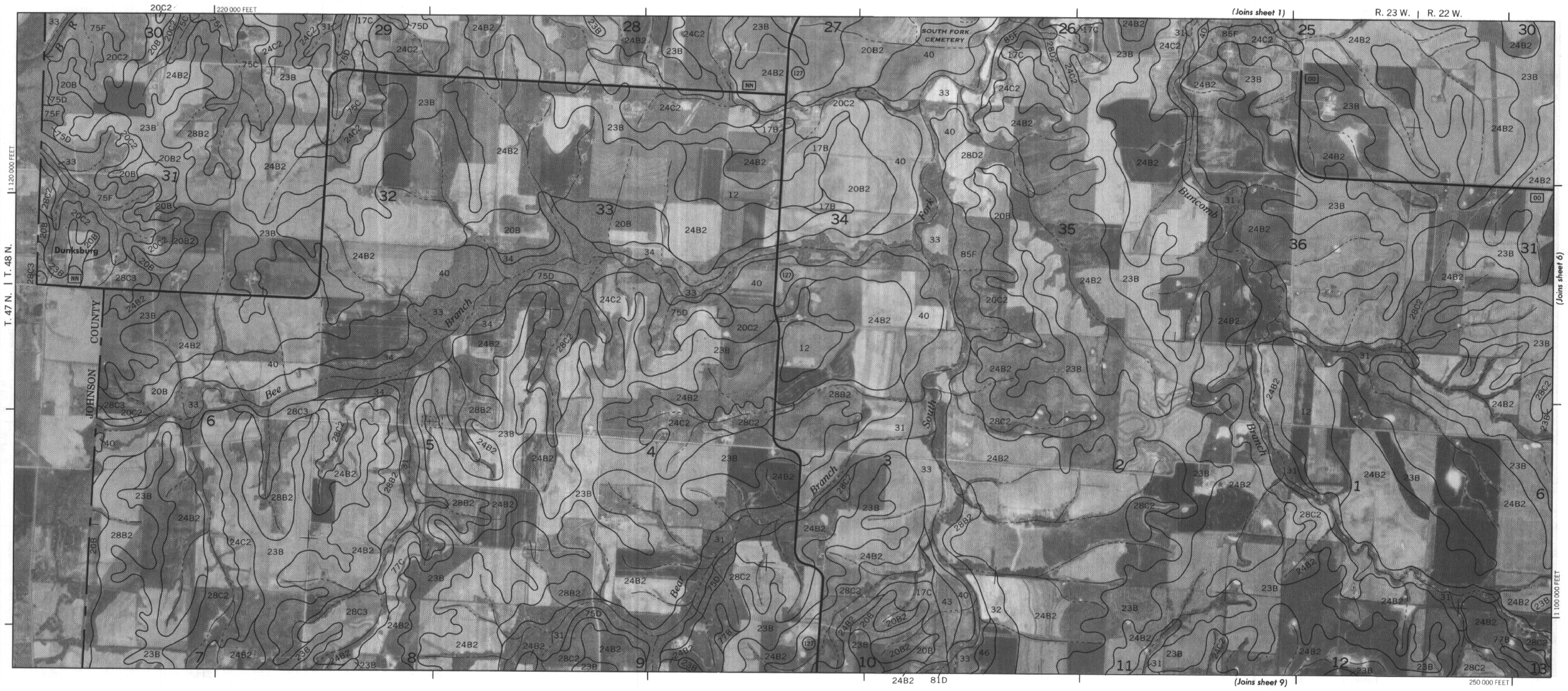
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

5

N



1 3/4 1/2 1/4 0 1 2 MILES

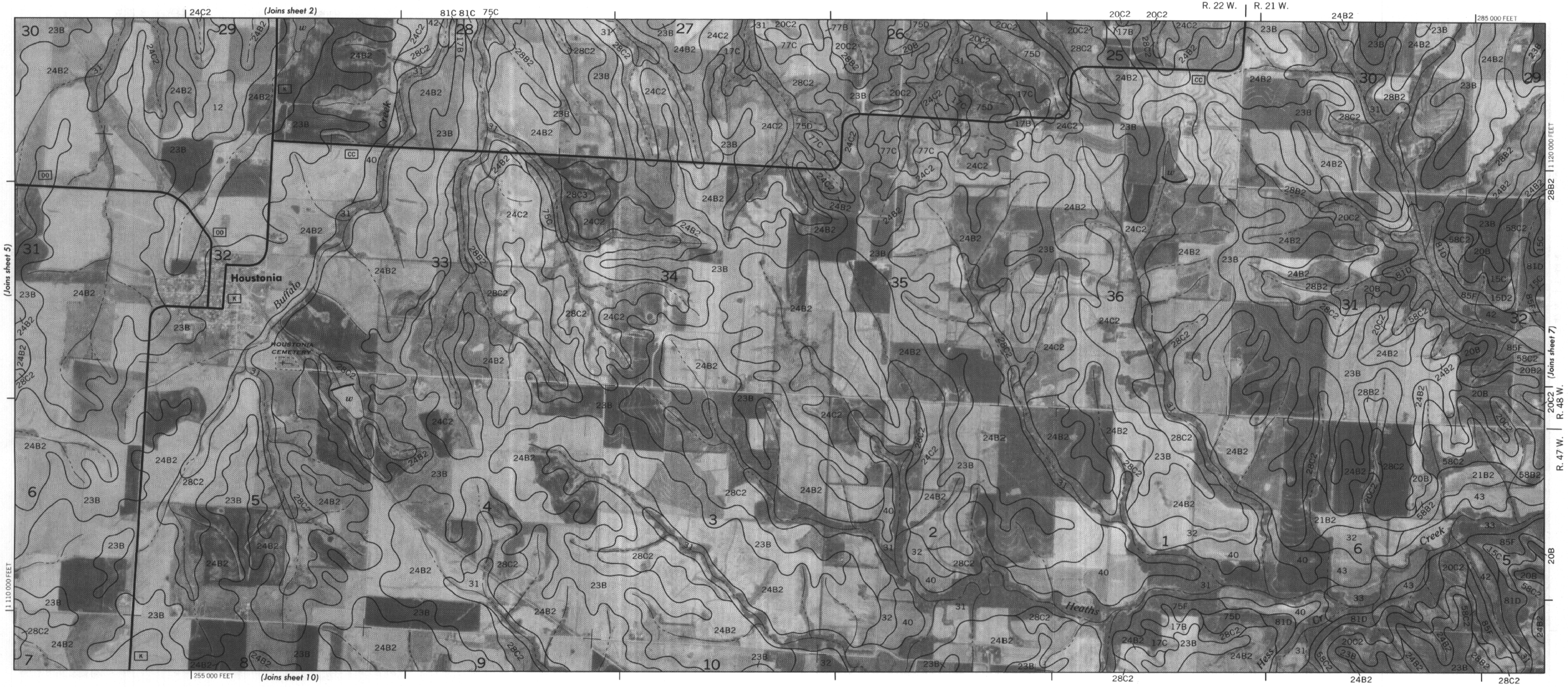
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

6

N



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 6

Index Map Welcome Page Manuscript

PETTIS COUNTY, MISSOURI NO. 7

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

N

1 3/4 1/2 1/4 0 1 2 MILES

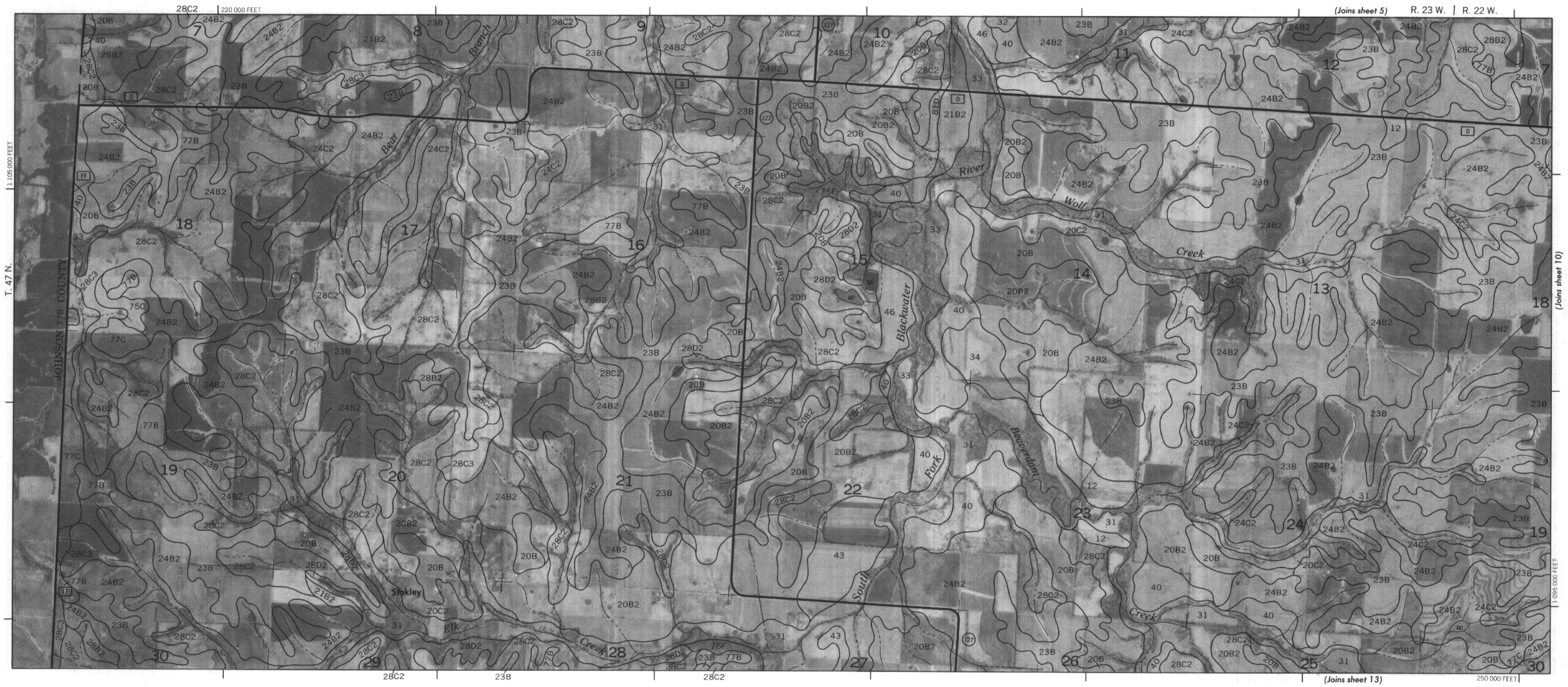
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 8

Index Map Welcome Page Manuscript

9
N

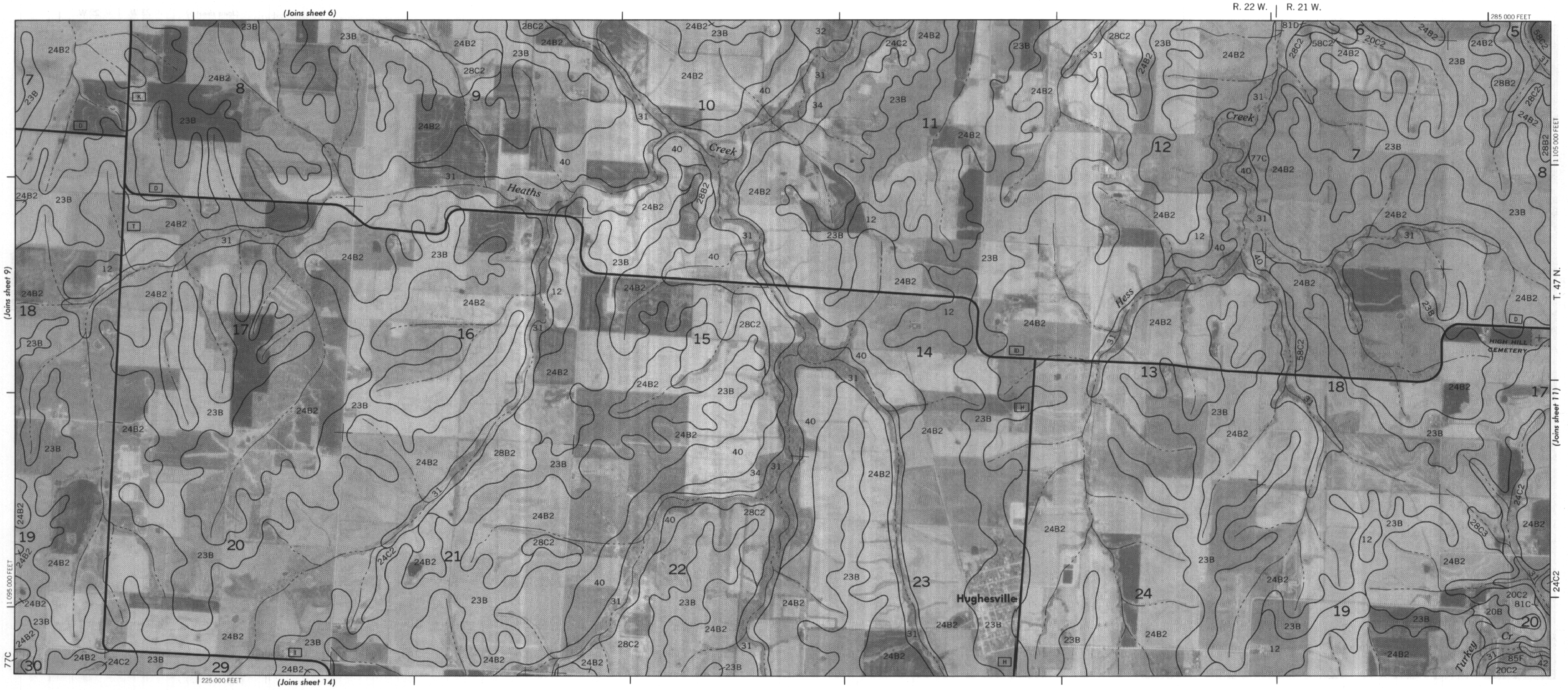


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript



1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

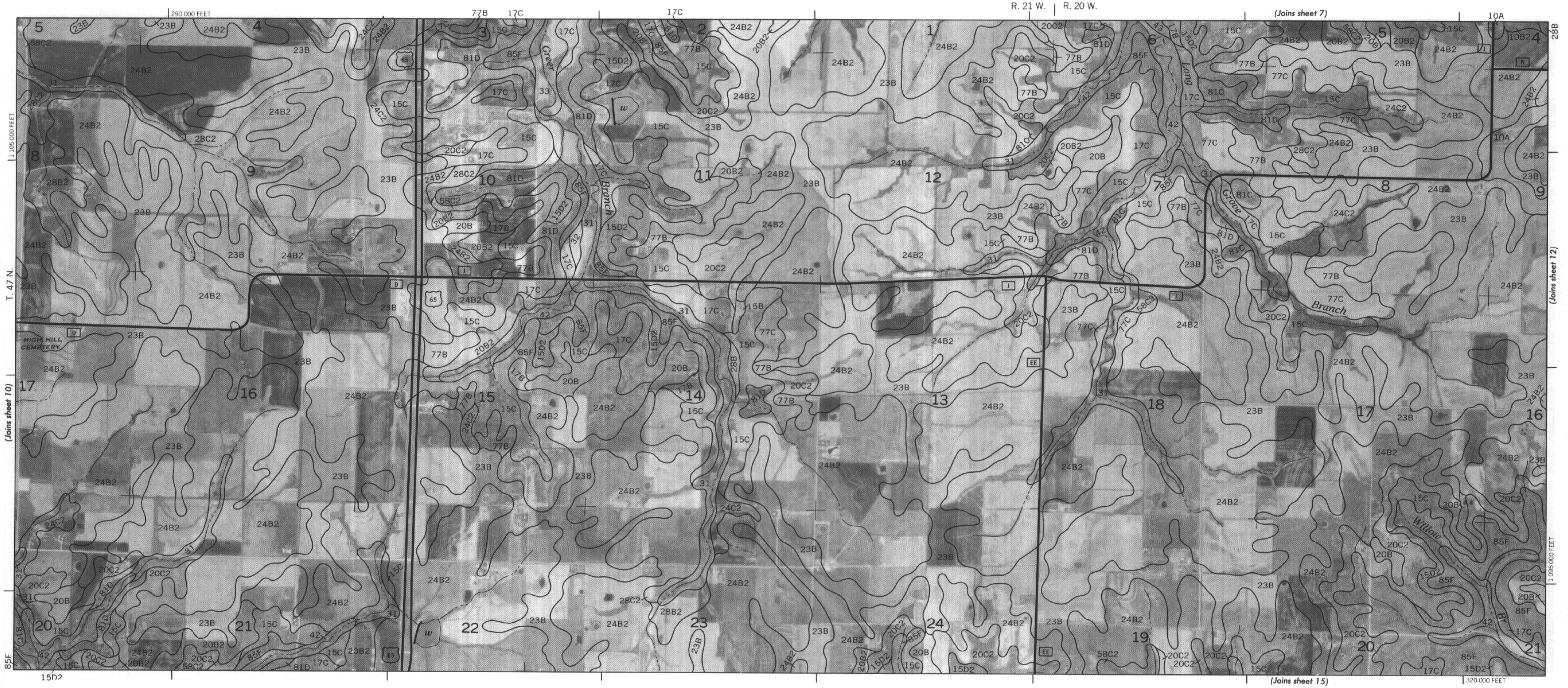
PETTIS COUNTY, MISSOURI NO. 10

Index Map Welcome Page Manuscript

11

N

PETTIS COUNTY, MISSOURI NO. 11



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

N

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

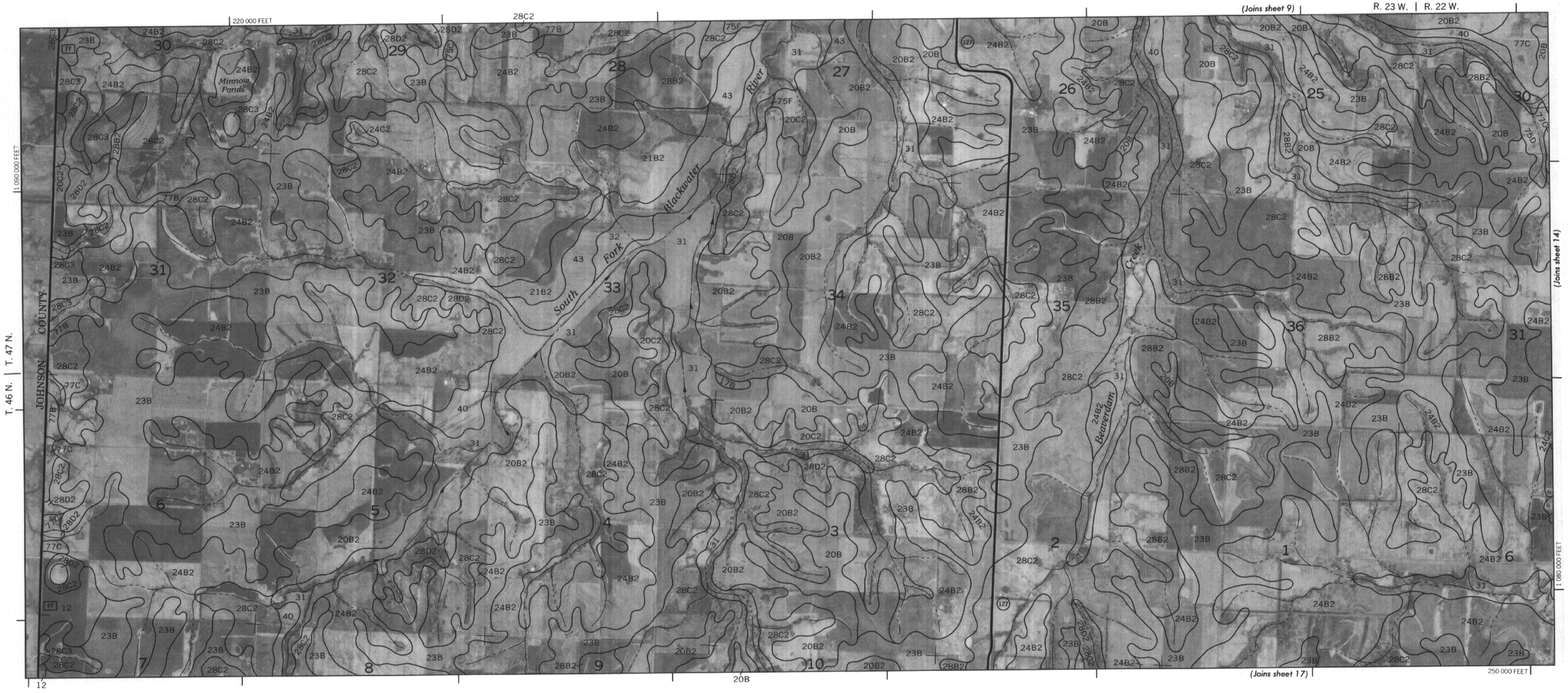
SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 12

Index Map Welcome Page Manuscript

N

PETTIS COUNTY, MISSOURI NO. 13



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

Index Map Welcome Page Manuscript

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 14

Index Map Welcome Page Manuscript

15

N

1 3/4 1/2 1/4 0 1 2 MILES

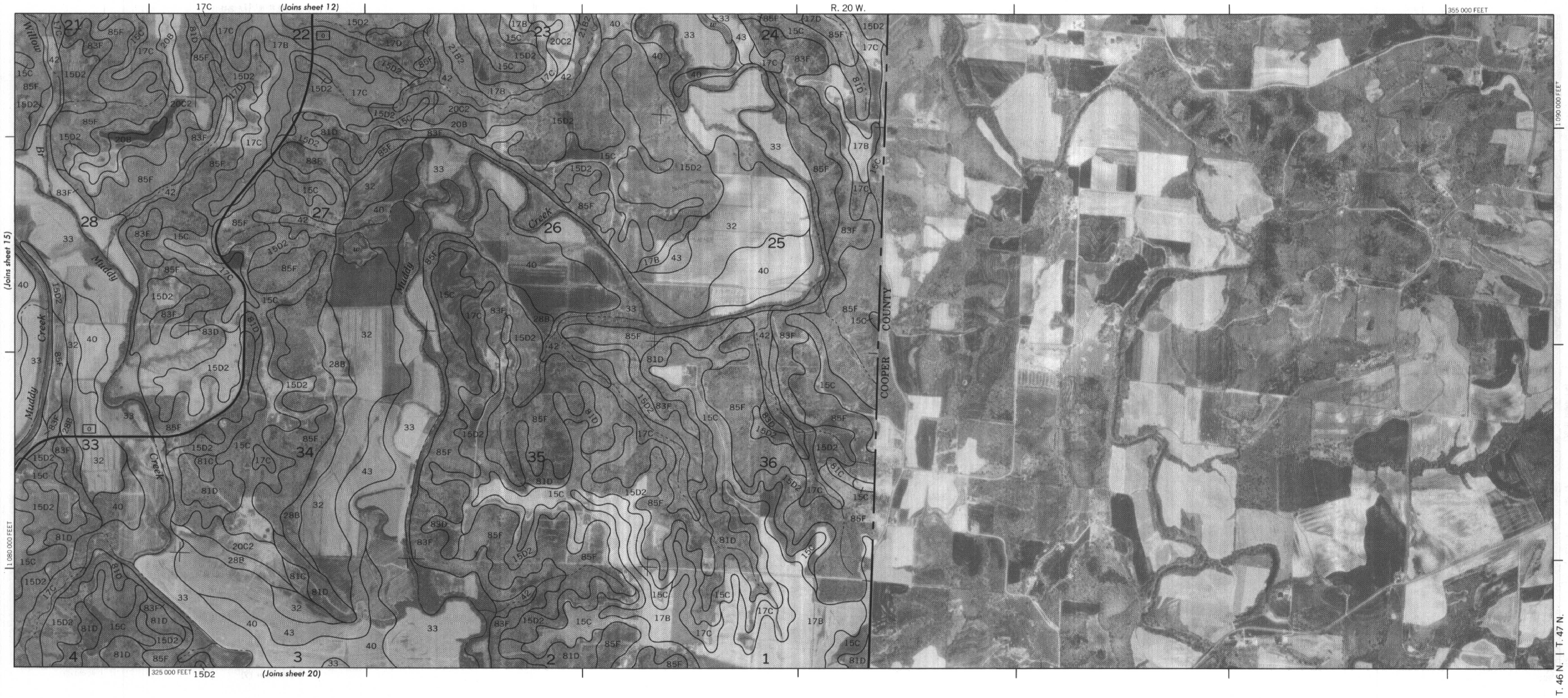
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 15

N

Index Map Welcome Page Manuscript

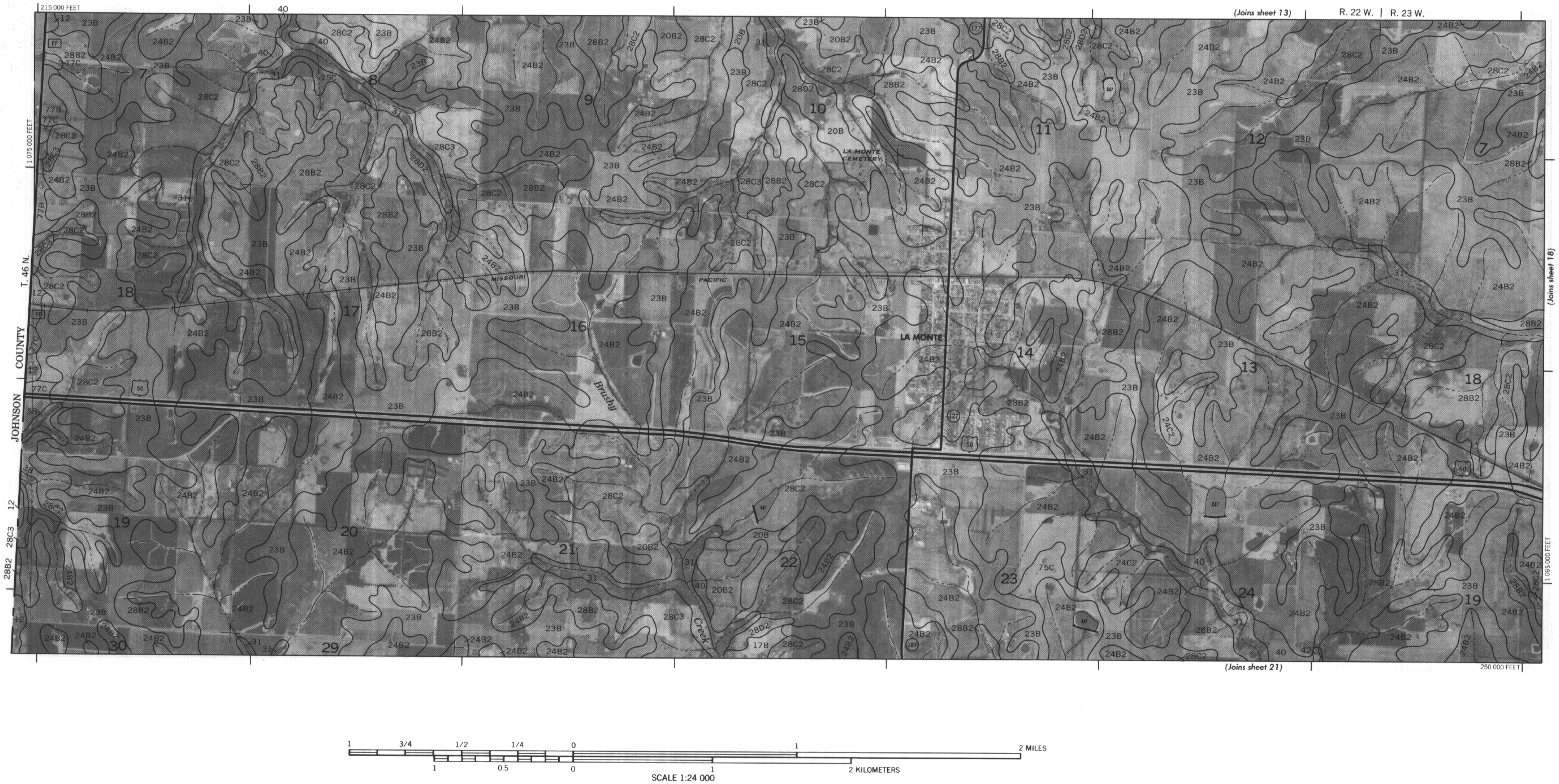


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

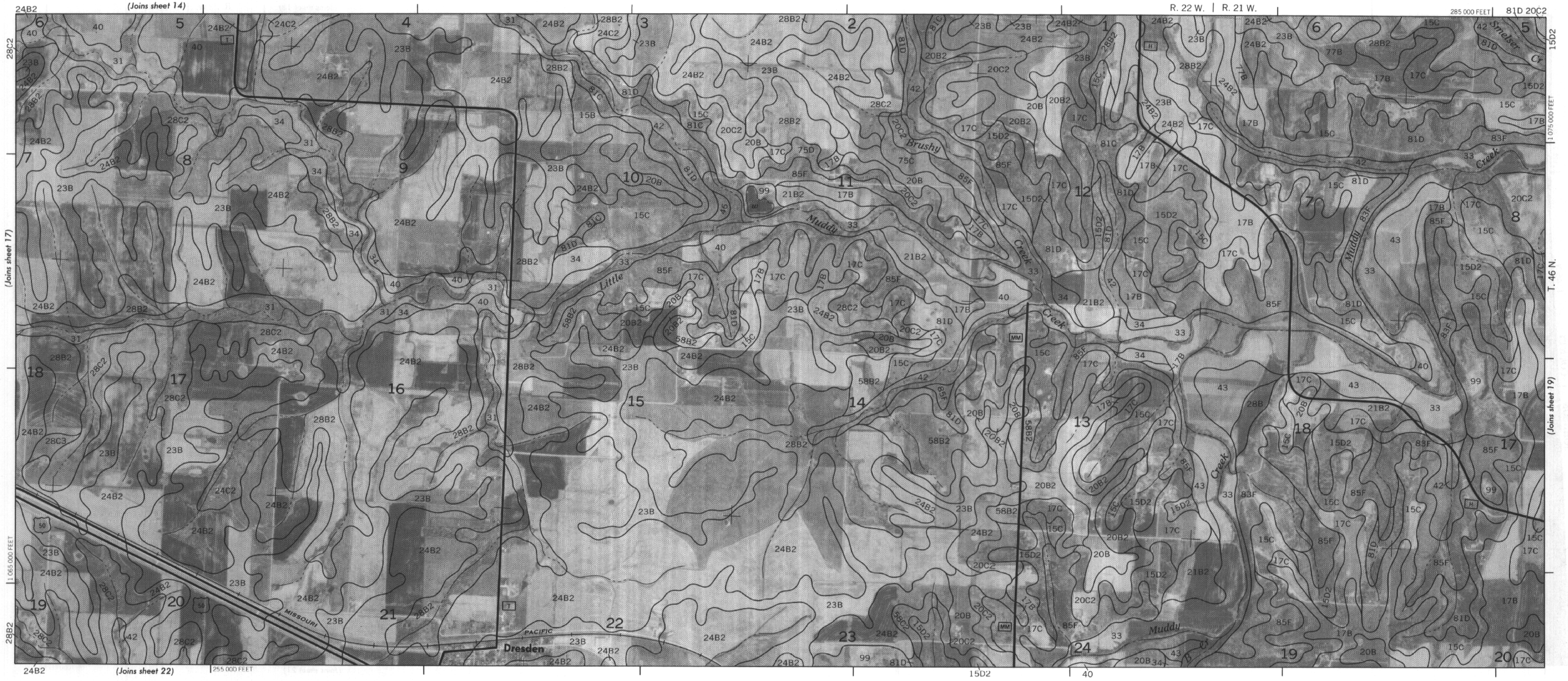
SCALE 1:24 000

Index Map Welcome Page Manuscript



Index Map Welcome Page Manuscript

N

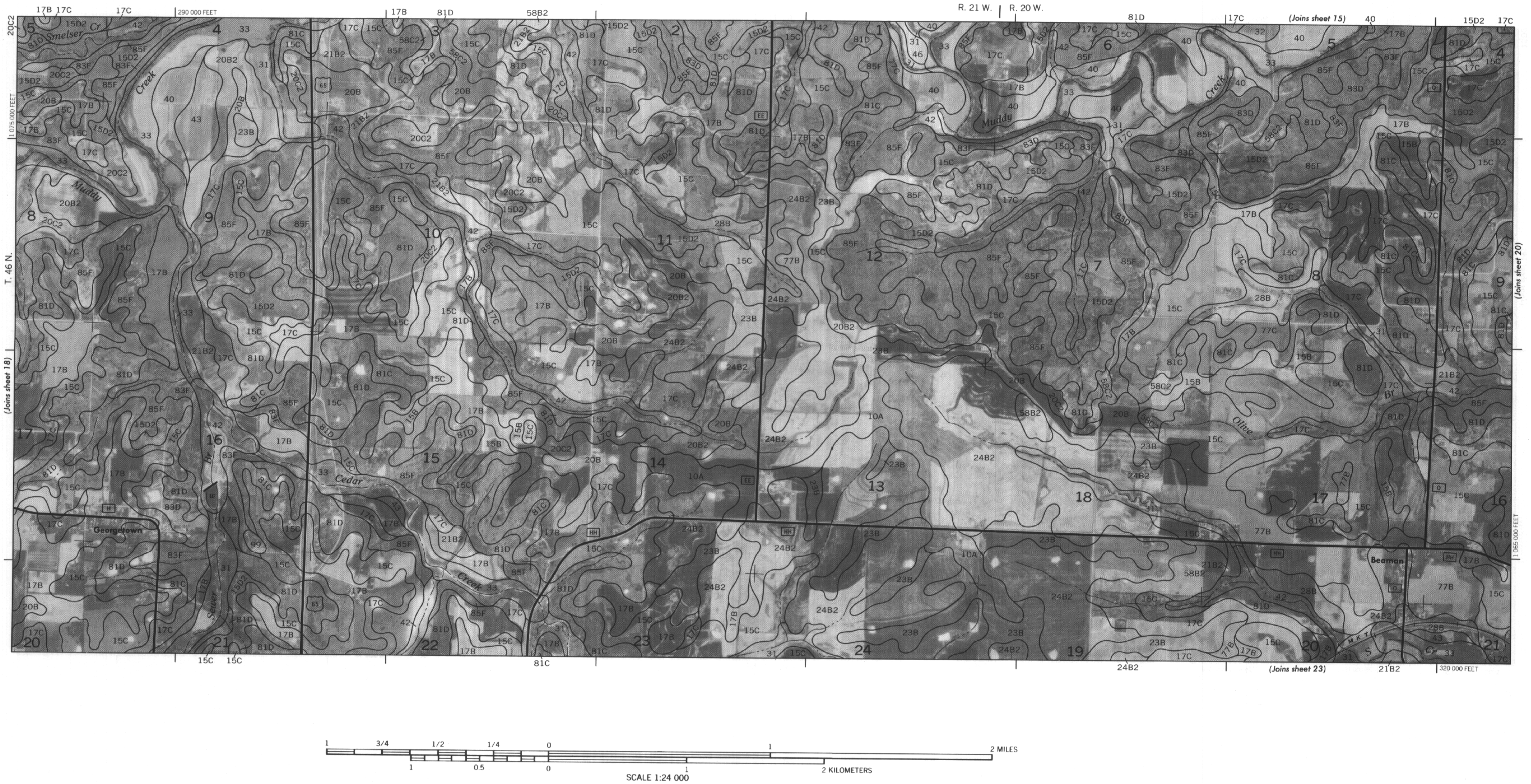


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

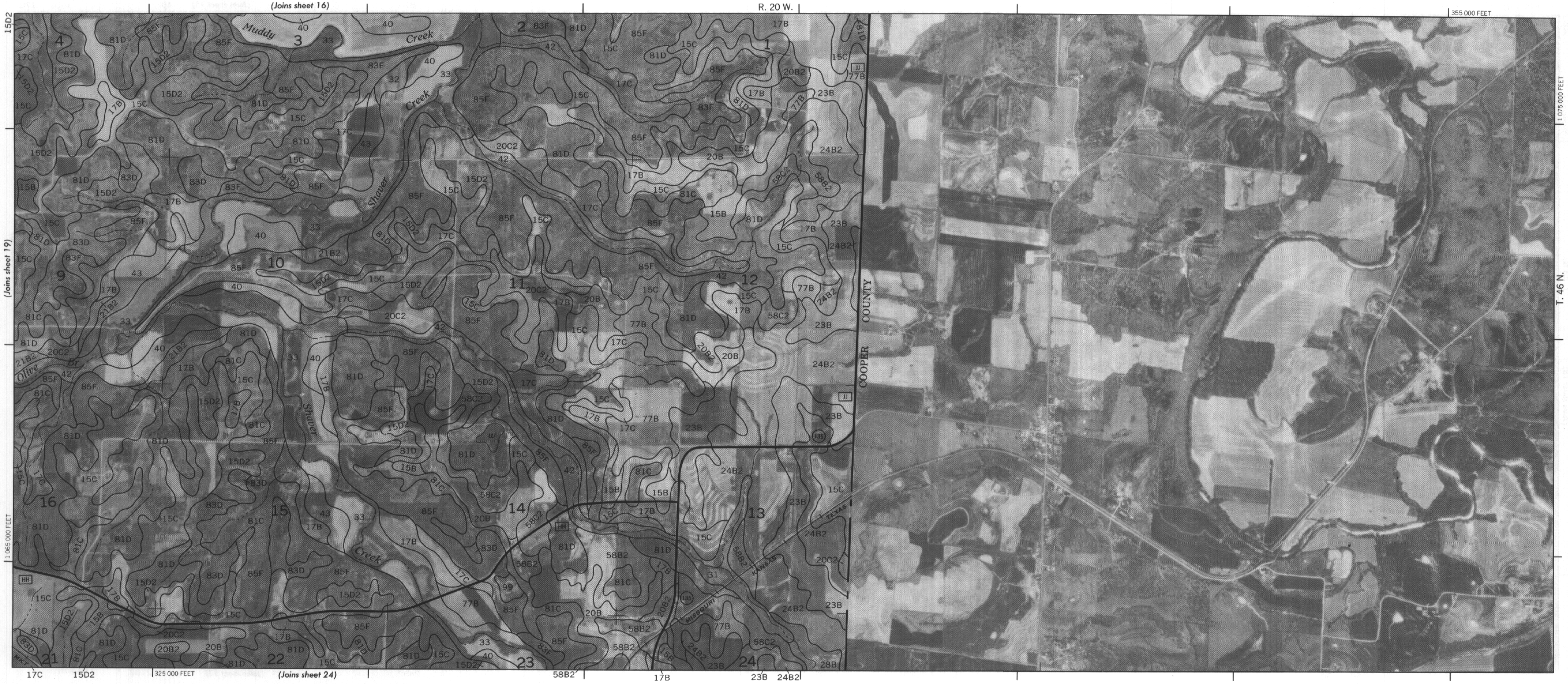
Index Map Welcome Page Manuscript



20

N

Index Map Welcome Page Manuscript



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

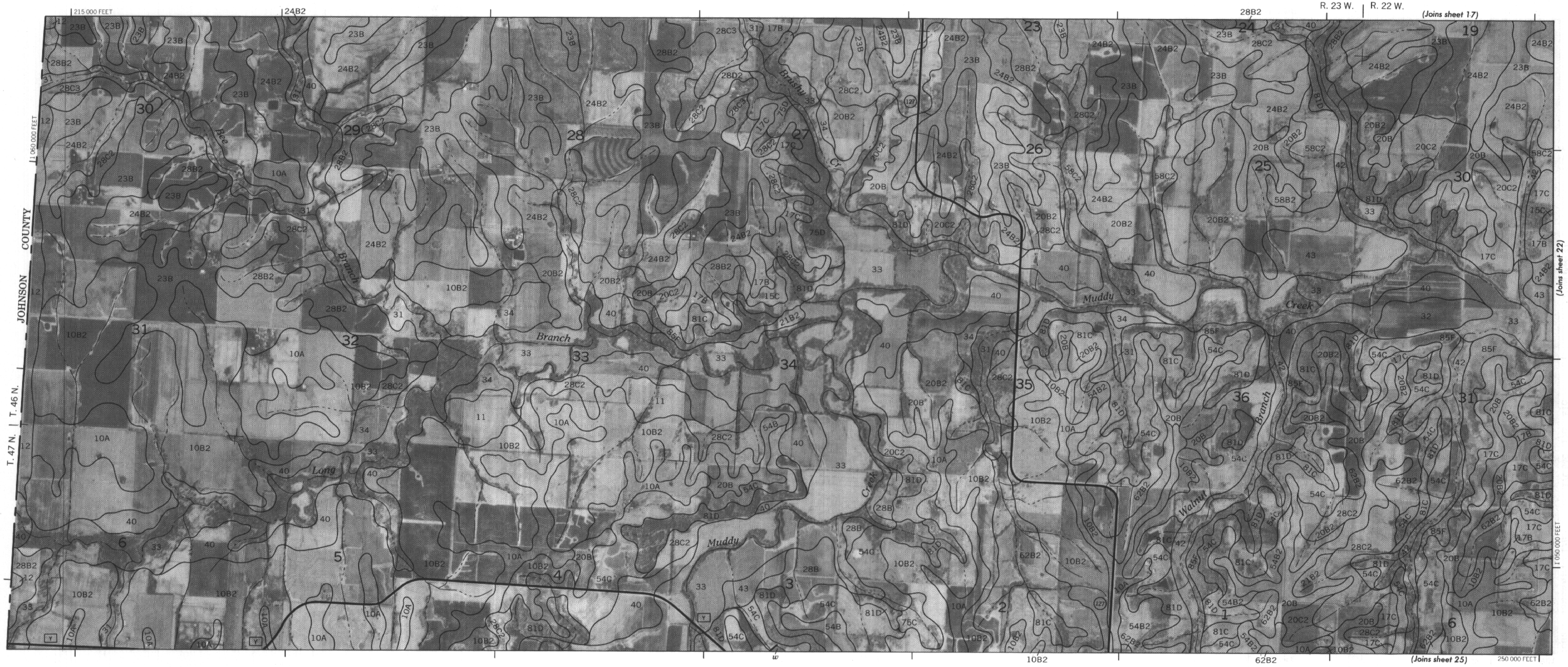
SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 20

Index Map Welcome Page Manuscript

21

N



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

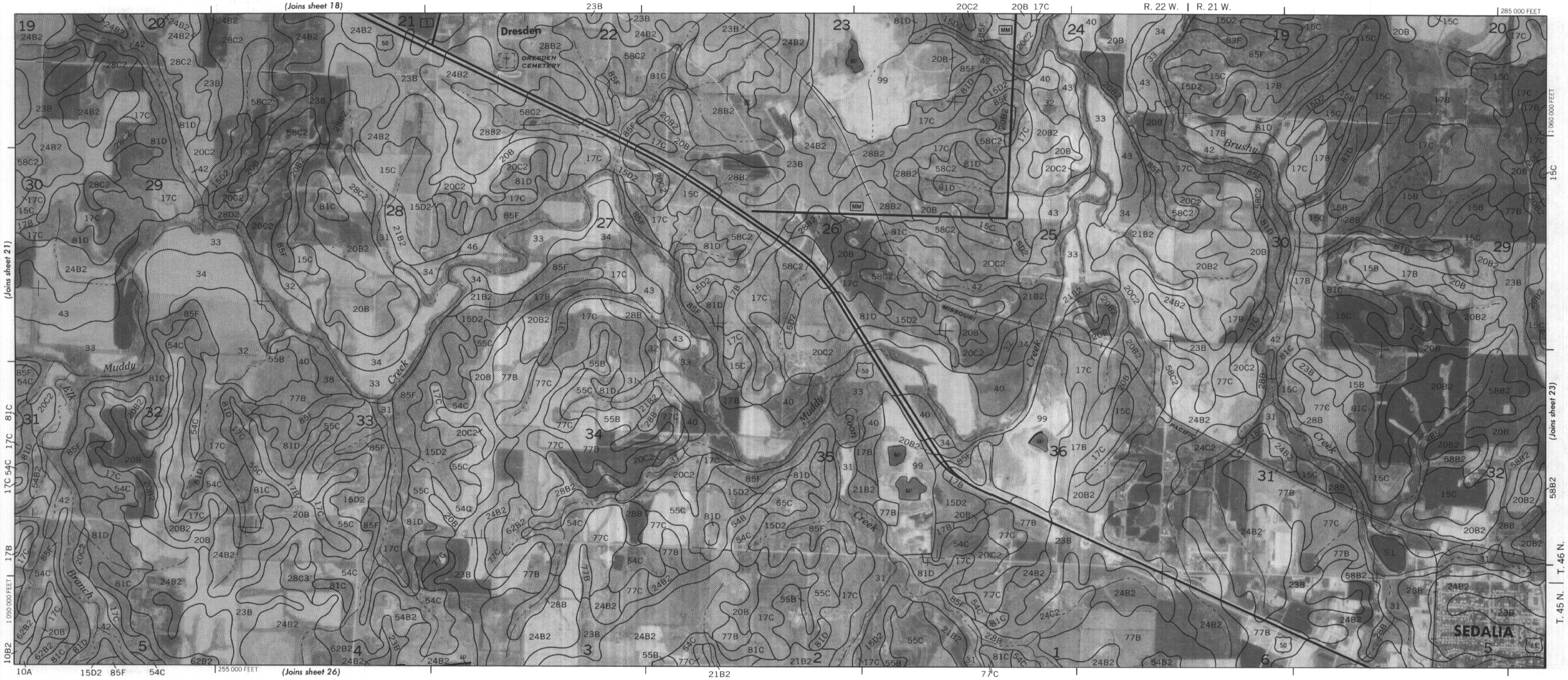
SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 21

Index Map Welcome Page Manuscript

22

N



1 3/4 1/2 1/4 0 1 2 MILES

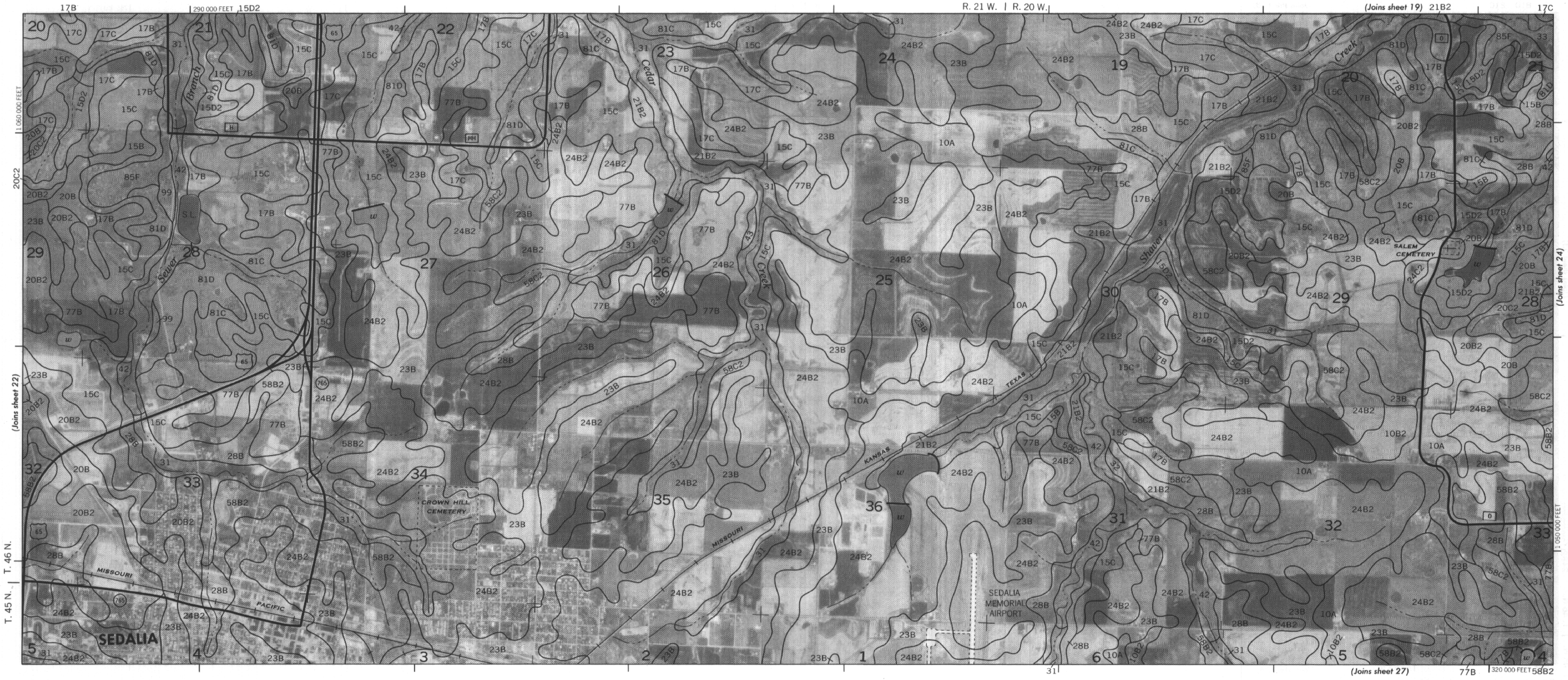
1 0.5 0 1 2 KILOMETERS

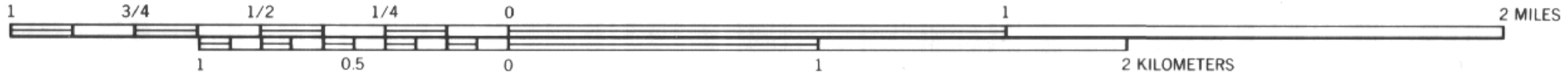
SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 22

Index Map Welcome Page Manuscript

N





SCALE 1:24 000

Index Map Welcome Page Manuscript

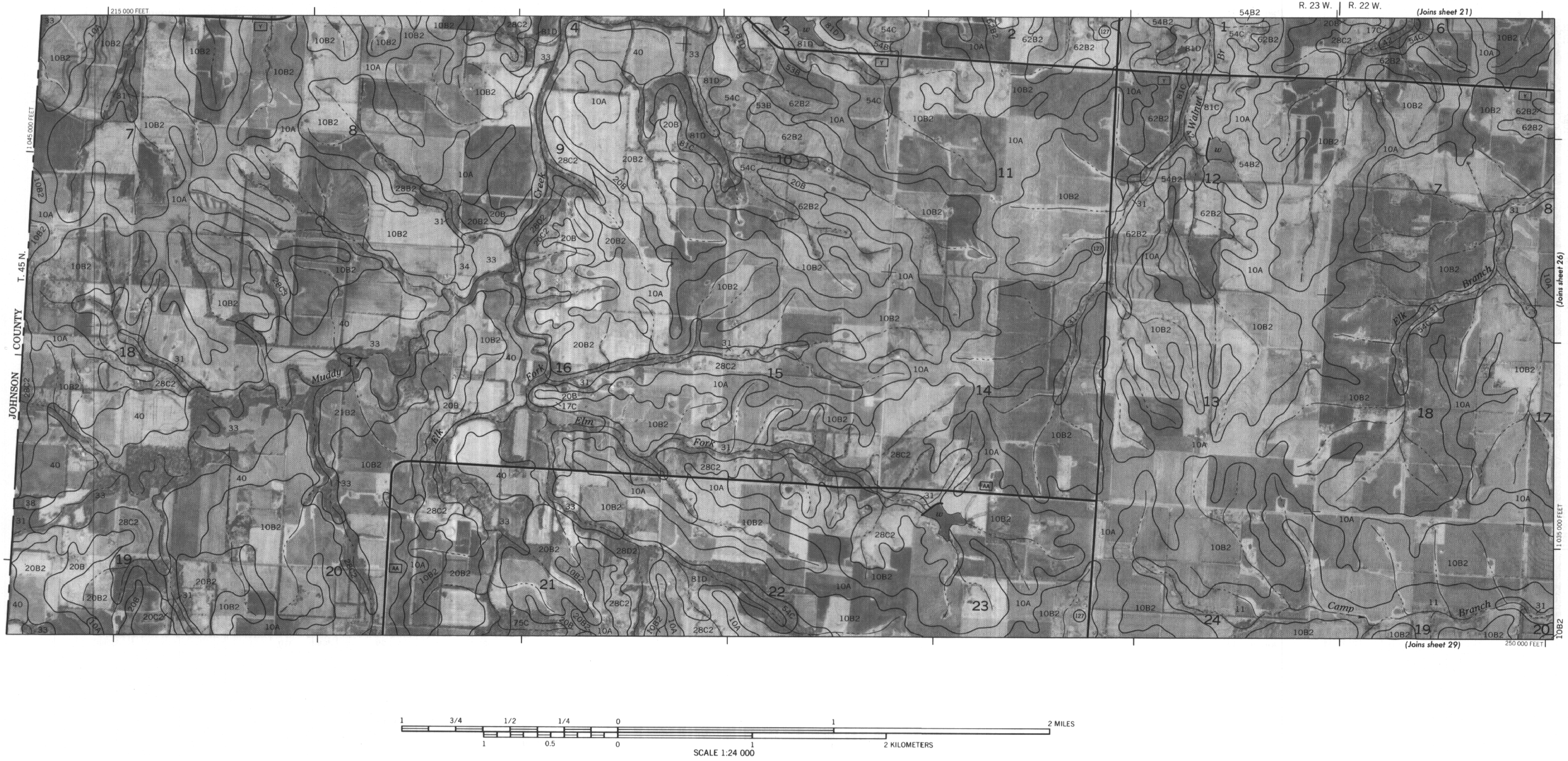
N

1 3/4 1/2 1/4 0 1 2 MILES

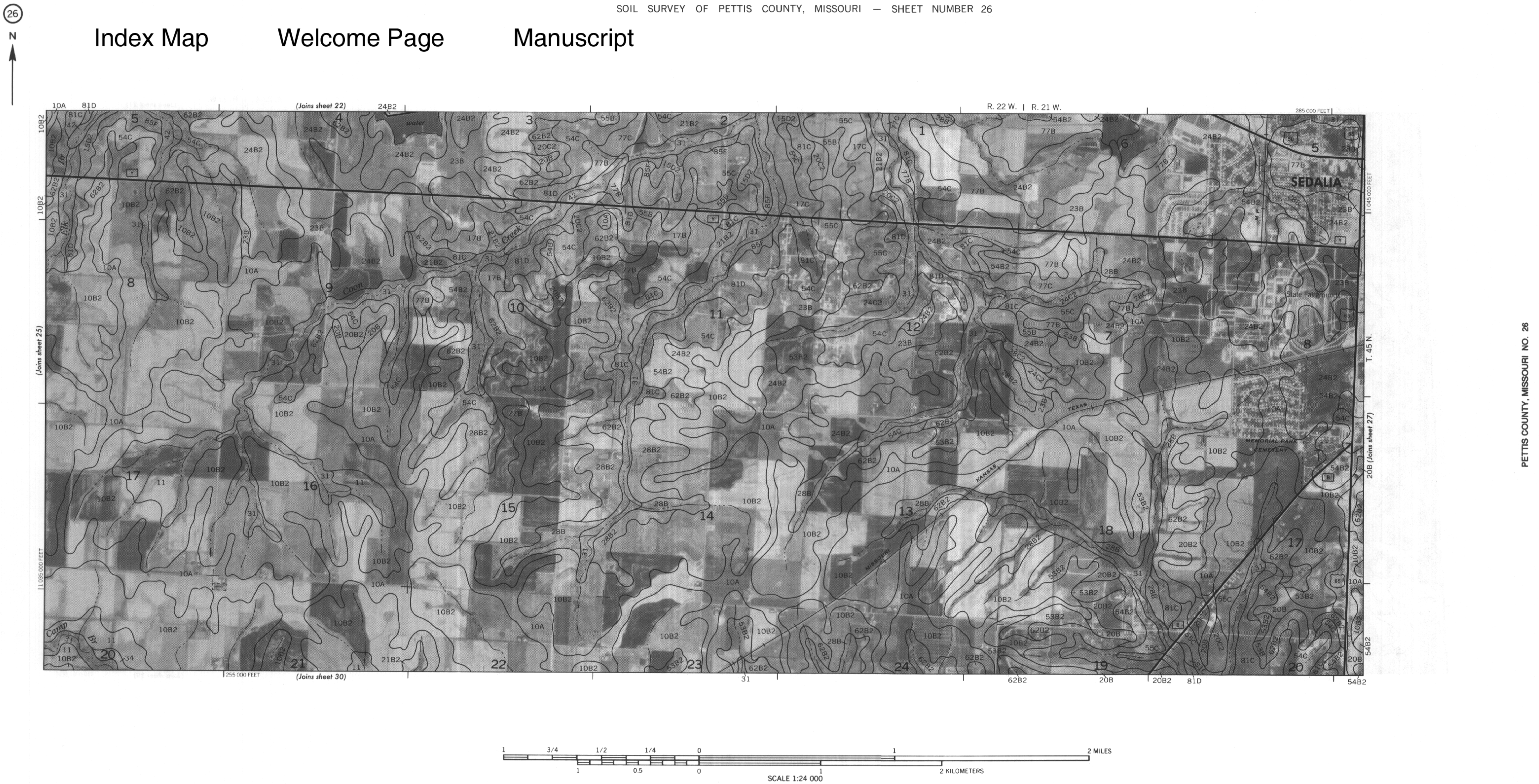
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript



Index Map Welcome Page Manuscript



Index Map Welcome Page Manuscript

27

N

PETTIS COUNTY, MISSOURI NO. 27

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

28

N

Index Map Welcome Page Manuscript

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

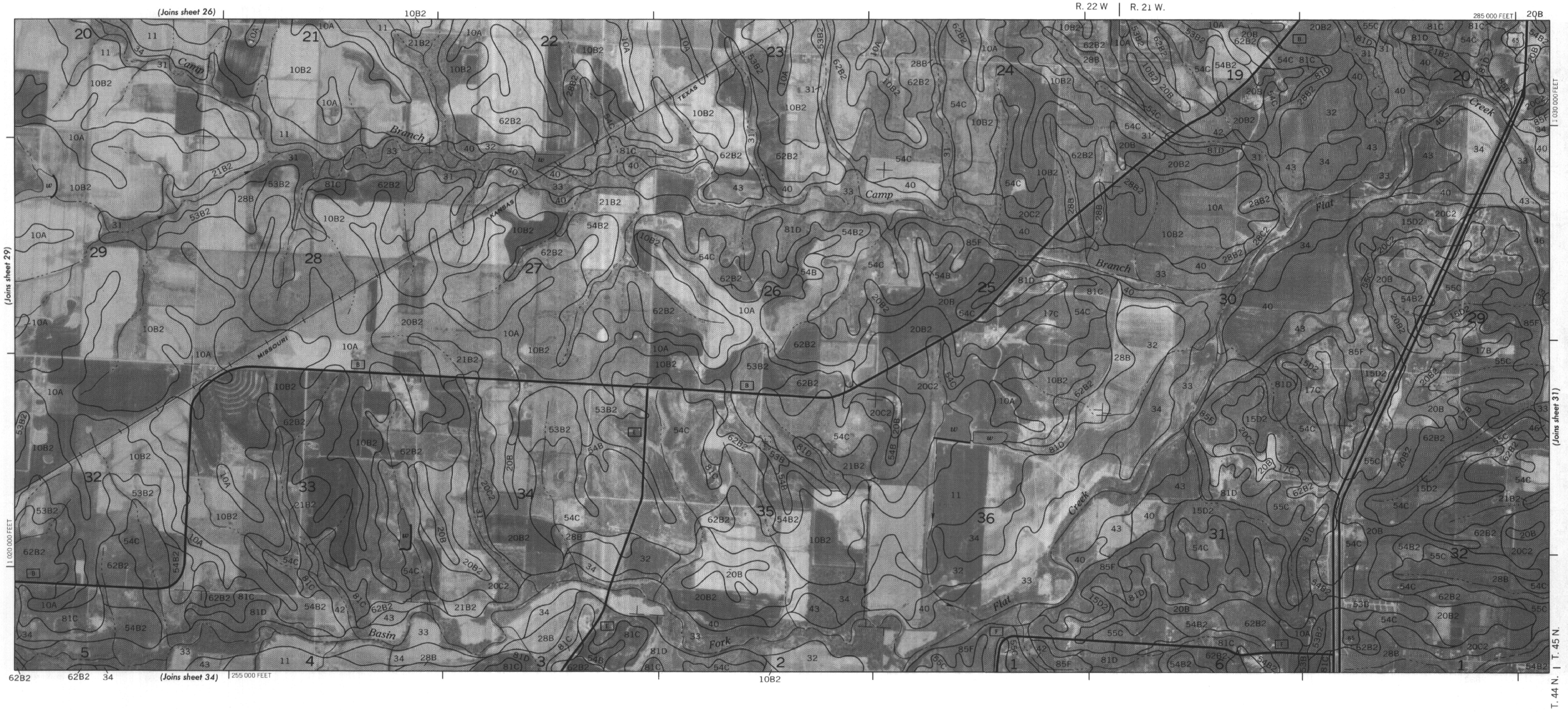
SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 28

Index Map Welcome Page Manuscript

Index Map Welcome Page Manuscript

N



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

PETTIS COUNTY, MISSOURI NO. 30

Index Map Welcome Page Manuscript

PETTIS COUNTY, MISSOURI NO. 31

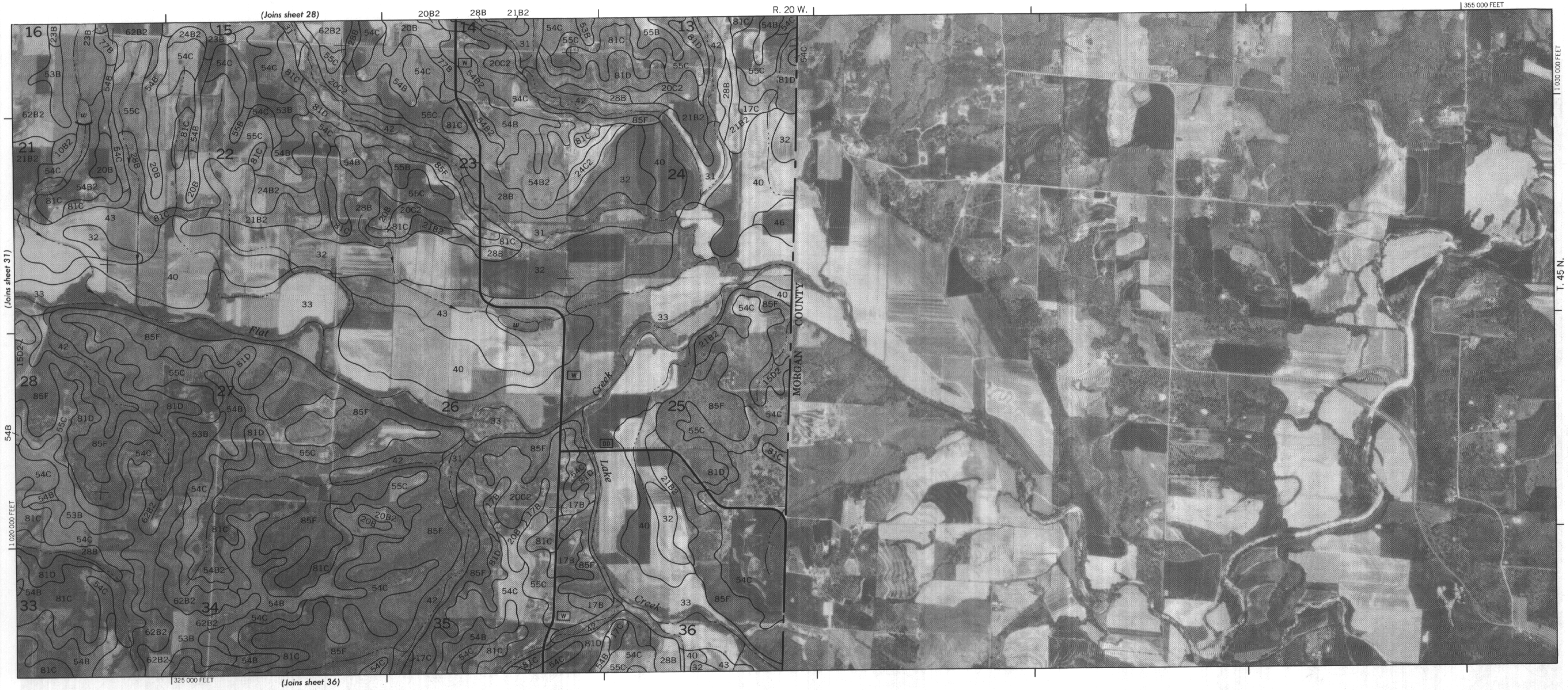
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

Index Map Welcome Page Manuscript



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

33

N

PETTIS COUNTY, MISSOURI NO. 33

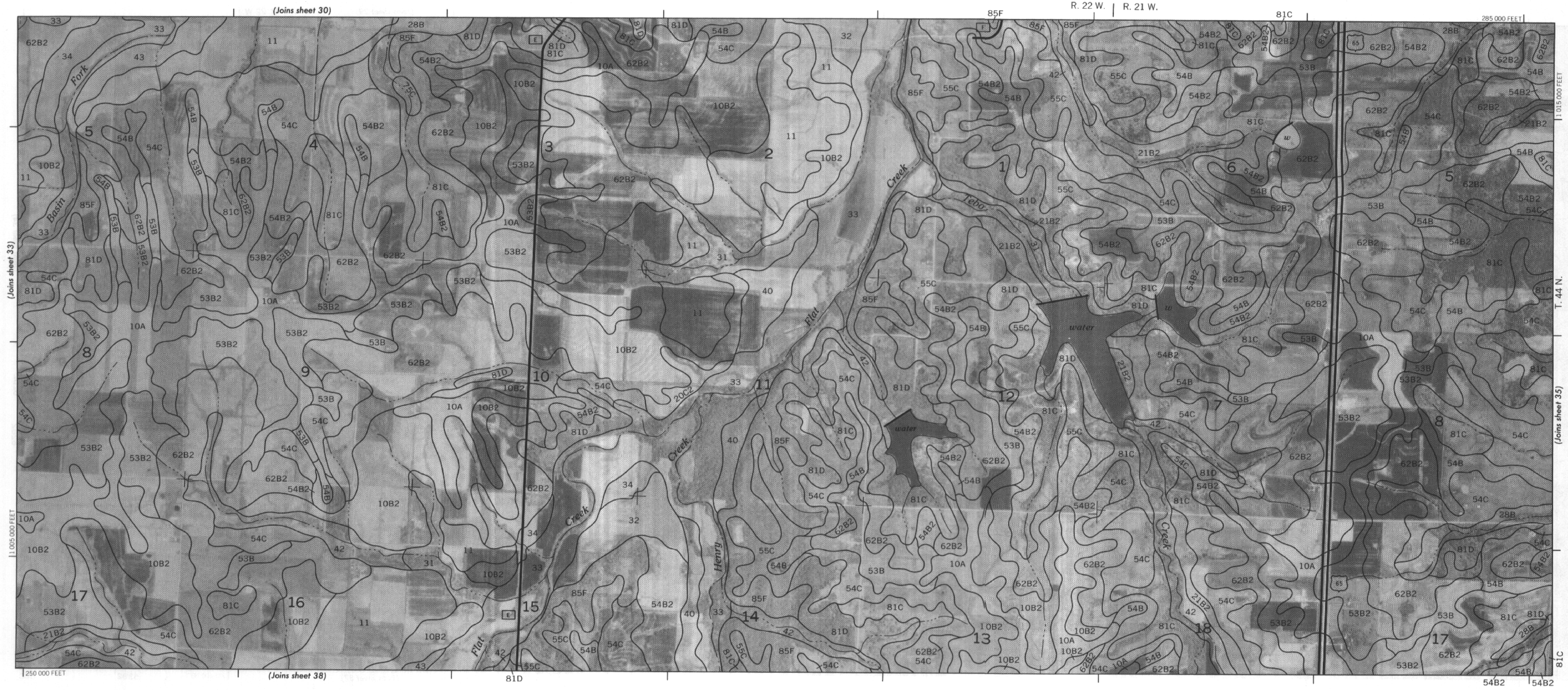
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

N



1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

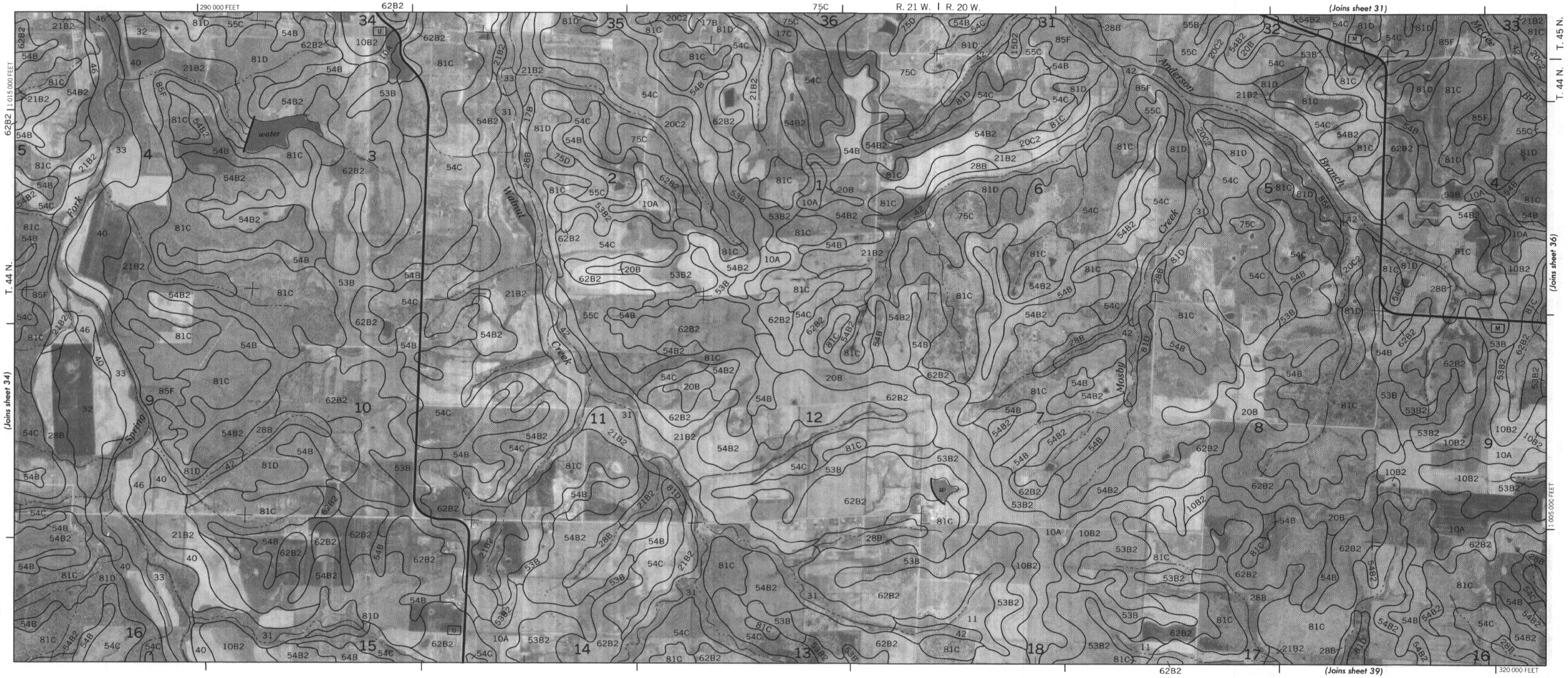
PETTIS COUNTY, MISSOURI NO. 34

Index Map Welcome Page Manuscript

35

N

PETTIS COUNTY, MISSOURI NO. 35



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

36

N

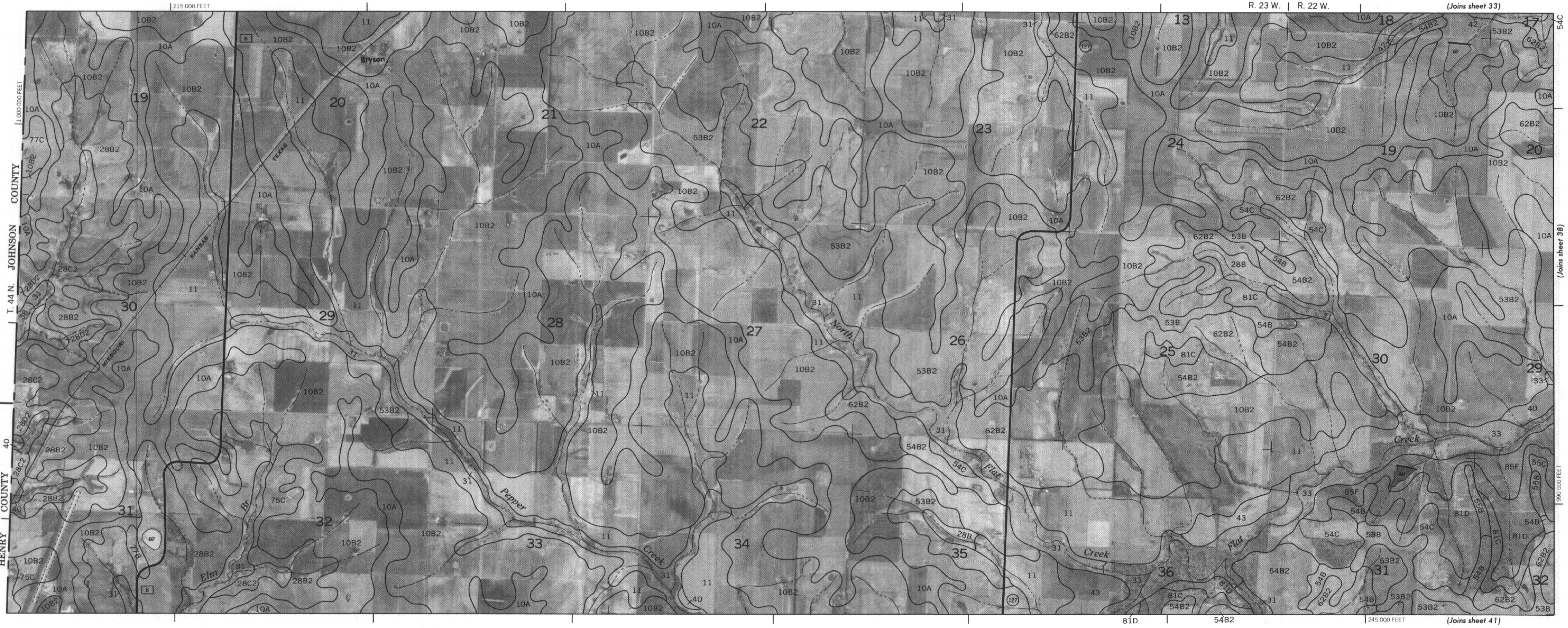
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

N



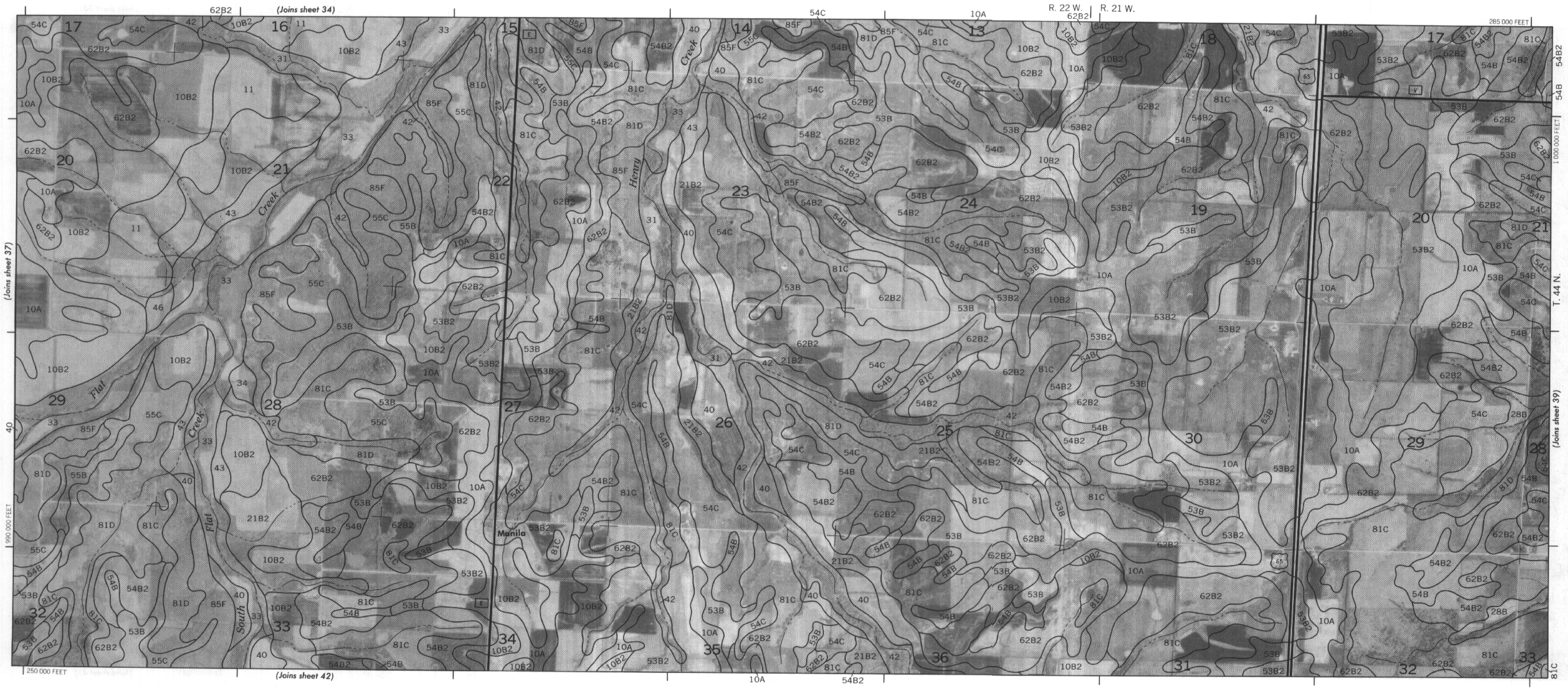
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

Index Map Welcome Page Manuscript

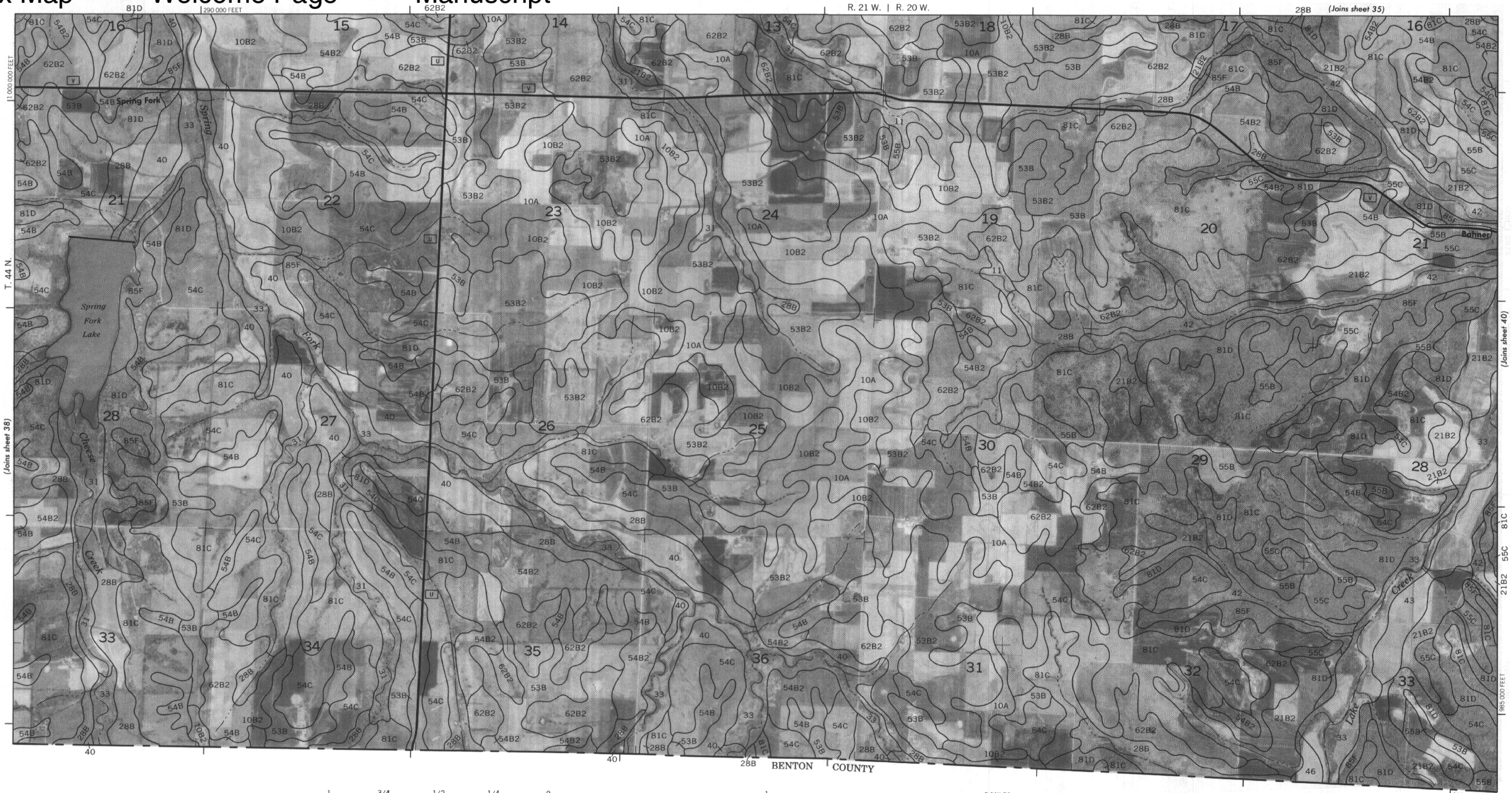


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

Index Map Welcome Page Manuscript

Index Map Welcome Page Manuscript

Index Map Welcome Page Manuscript